# MICROBIAL CONTROLS ON METAL ION MOBILITY

By


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Submitted to the Department of Geology and the Faculty of the Graduate School of The University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Date defended: December 10, 2012

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# ABSTRACT

Karla Leslie, Ph.D.
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In this dissertation, the biogeochemical controls on metal mobility in the subsurface are examined; specifically, the release of metals from buried mineralization, the transport of metals through overburden, and the sequestration of metals in soil. Field investigations were carried out to determine the relevant microbial ecology in direct proximity to and in soil overlying a buried volcanogenic massive sulfide (VMS) Cu-Zn deposit, and column experiments were completed to examine the biogeochemical controls on metal mobility in the subsurface. It was determined that the microbial abundance and community composition in soil overlying mineralization was significantly different than background locations, and therefore, can serve as a tool in the exploration for economic deposits. It was also determined that biogeochemical processes in the subsurface increase the mobility of metals, directly influencing the subsequent sequestration in the soil zone. Based on this research, it is clear that biogeochemical processes in the subsurface increase the development of the surficial soil anomalies used in the exploration for buried mineralization.

## ACKNOWLEDGMENTS

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Retrum, Erin Young, Sarah Evans, Joe Miller, Ben Rickards and Breanna Huff, to name a few. A specific thanks to Sean Crowe, CarriAyne Jones, and Arne Sturm for everything I learned through our immense collaborations on Lake Matano.

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# CHAPTER 1. INTRODUCTION

The search for economic mineral deposits has become increasingly challenging, as the majority of undiscovered ore deposits are obscured by overburden sequences of sedimentary rock and soil (Cameron et al., 2004; Gilliss et al., 2004; Kelley et al., 2006). Far field features are signals that are attributed to the presence of a mineral deposit that extends beyond its physical presence (Kelley et al., 2006). These features are considered primary if they formed in association with the deposit, and secondary if they formed from the interaction with the deposit (Kelley et al., 2006). The present research is related to the biogeochemical controls on the development of secondary far field features, collectively referred to as a surface anomaly, in the search for deeply buried mineral deposits.

The presence of these features and their mechanisms of formation vary widely, based upon deposit type, geographic location, and regional geology. Soil metal anomalies that have formed above deposits in northern glaciated terrain are of especial interest, as in many cases the surface anomaly has developed in less than 10,000 years, through hundreds of meters of clay (Bajc, 1998). Some of the secondary far field features that occur in glaciated terrain include isotopic anomalies (Cameron et al., 2004; Kelley et al., 2006; Polito et al., 2007; Simonetti et al., 1996), accumulation zones of mobile indicator metals in specific soil phases targeted by selective extractions (Bajc, 1998; Cameron et al., 2004; Gilliss et al., 2004), zones of anomalous pH (Smee, 1998), high redox contrast (Hamilton et al., 2004a, b), vegetation type and metal content (Anand, 2007; van Geffen et al., 2012b), gas and volatile compound flux (Alpers et al., 1990; Fu et al., 2005; Gao et al., 2011; Lollar et al., 2006; Malmqvist et al., 1999), and soil microbiology (Melchior et al., 1996; Parduhn, 1991; Reith et al., 2005; Reith and Rogers, 2008; Wakelin et al., 2012). The proposed mechanisms of formation of these secondary far field features in glaciated terrain (Figure 1) include electrochemical dispersion (Hamilton, 1998), glacial rebound (van Geffen, 2011), dispersion of gas (Cameron et al., 2004), and biological accumulation (van Geffen et al., 2012b).

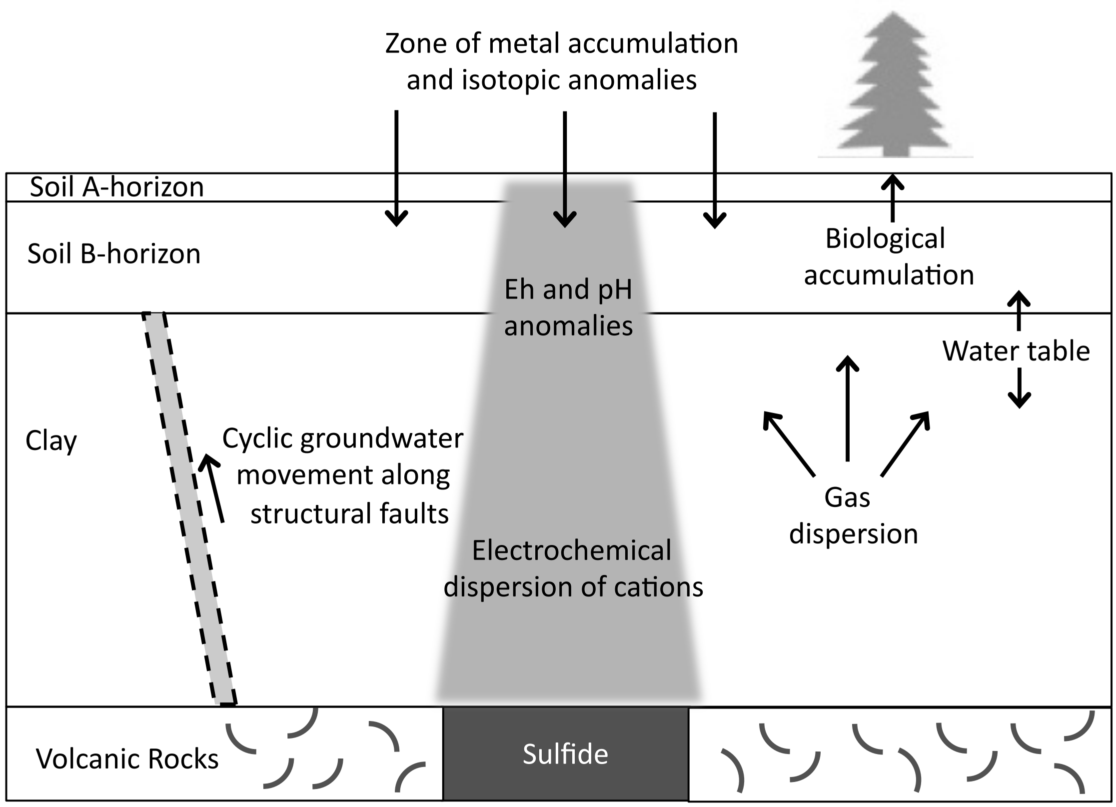


Figure 1: Schematic of the secondary far field features associated with a buried economic sulfide deposit in northern Canada glaciated terrain (Modified after Kelley et al., 2006).

Electrochemical dispersion has been proposed to explain the movement of metals through clays with very low hydraulic conductivity, where a reduced column forms over mineralization (Hamilton, 1998). Metal ions are mobile throughout the reduced column, and precipitate when the oxic zone of the soil is encountered. Redox and pH anomalies over mineralization are also present as a result of the development of the reduced column. Another explanation for the hydraulic movement of chemical indicators of buried mineralization is upward movement of water along structural faults, due to periodic events such as glacial rebound or barometric pumping (Cameron et al., 2004). Many indicators of buried mineralization, such as sulfur compounds and hydrocarbons, are gaseous and do not require hydraulic movement for transport to surface, and the movement of gaseous compounds can also scavenge and transport metals (Kelley et al., 2006). Nutrient uptake by vegetation can also impact metal transport through the subsurface, and the type of vegetation present as well as the metal content of the vegetation has been used in geochemical exploration for buried deposits (Wakelin et al., 2012).

Secondary far field features that have formed above Cu-porphyry deposits in southern desert terrain are an interesting contrast to deposits in glaciated terrain, as the hypogene sulfides, supergene sulfides, surrounding bedrock and overlying desert gravels and soils are highly fractured and hydraulically connected (Kelley et al., 2006). The most common secondary far field features in this environment are elemental and isotopic anomalies at the surface (Figure 2). It has been proposed that cyclic pumping, such as the occurrence of earthquakes, causes the saline formation water at depth to rise along the fracture zone towards the surface (Cameron and Leybourne, 2005). Flooding by formation waters occurs frequently, as documented by soil anomalies above fracture zones primarily in the elements that are mobile as anions, such as Cl, As, Mo and Se, however, Cu soil anomalies only occur above buried supergene enrichment (Cameron and Leybourne, 2005).

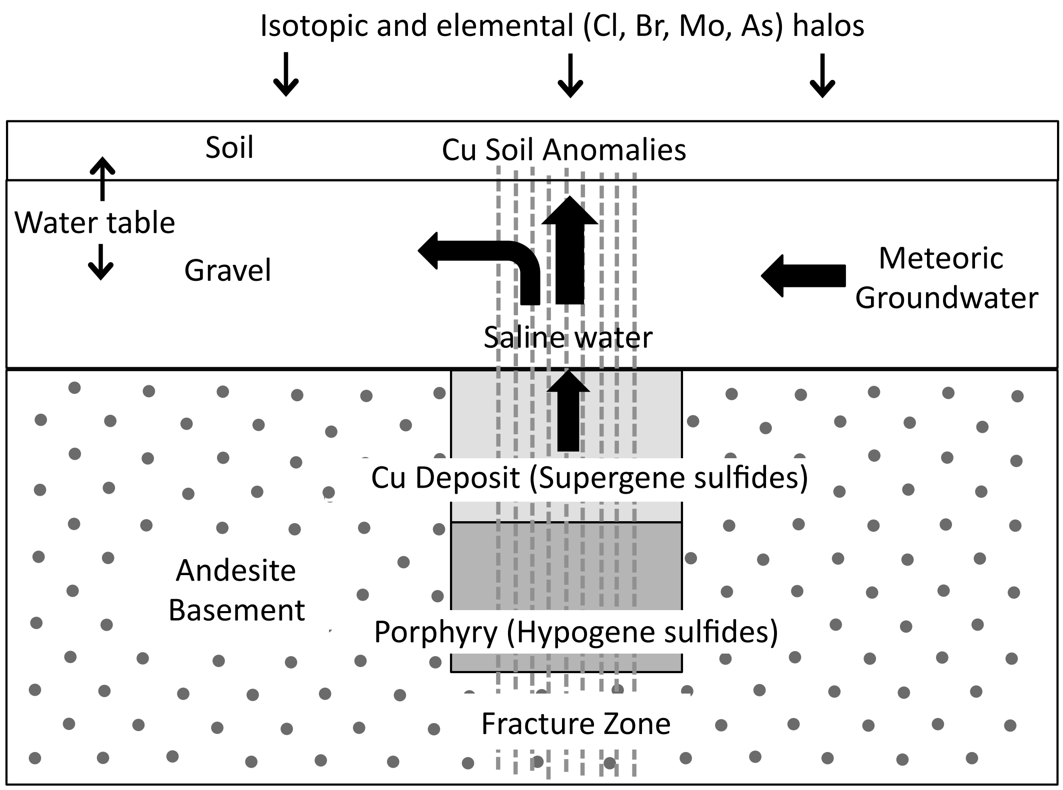


Figure 2: Schematic of the secondary far field features associated with a buried economic sulfide deposit in South American desert terrain (Modified after Kelley et al., 2006).

Microbial processes in the subsurface can affect the generation of all the secondary far field features in the glaciated terrain (Figure 3). Extreme isotope depletions in many systems ($\delta^{13}C$, $\delta^{34}S$) are due to microbial activity (Bawden et al., 2003; Nelson et al., 2007), as is the generation of mobile methylated metal complexes and hydrocarbons (Southam and Saunders, 2005). All microbial metabolisms generate redox gradients and gaseous by-products, significantly adding to the electrochemical and gaseous dispersion occurring above buried mineralization (Southam and Saunders, 2005). At the surface, microorganisms affect organic carbon cycling and secondary mineral precipitation, and both these soil fractions efficiently scavenge metals for anomaly development (Cameron et al., 2004). Some metals are scavenged by specific microorganisms, and can be used as an indicator for mineralization (Parduhn, 1991; Reith et al., 2005; Wakelin et al., 2012). The oxidation and metal release from Cu-porphyry deposits in arid desert terrains is greatly increased by the activity of S- and Fe- oxidizing organisms, as is the subsequent sequestration by sulfate reducing organisms (Enders et al., 2006; Southam and Saunders, 2005).

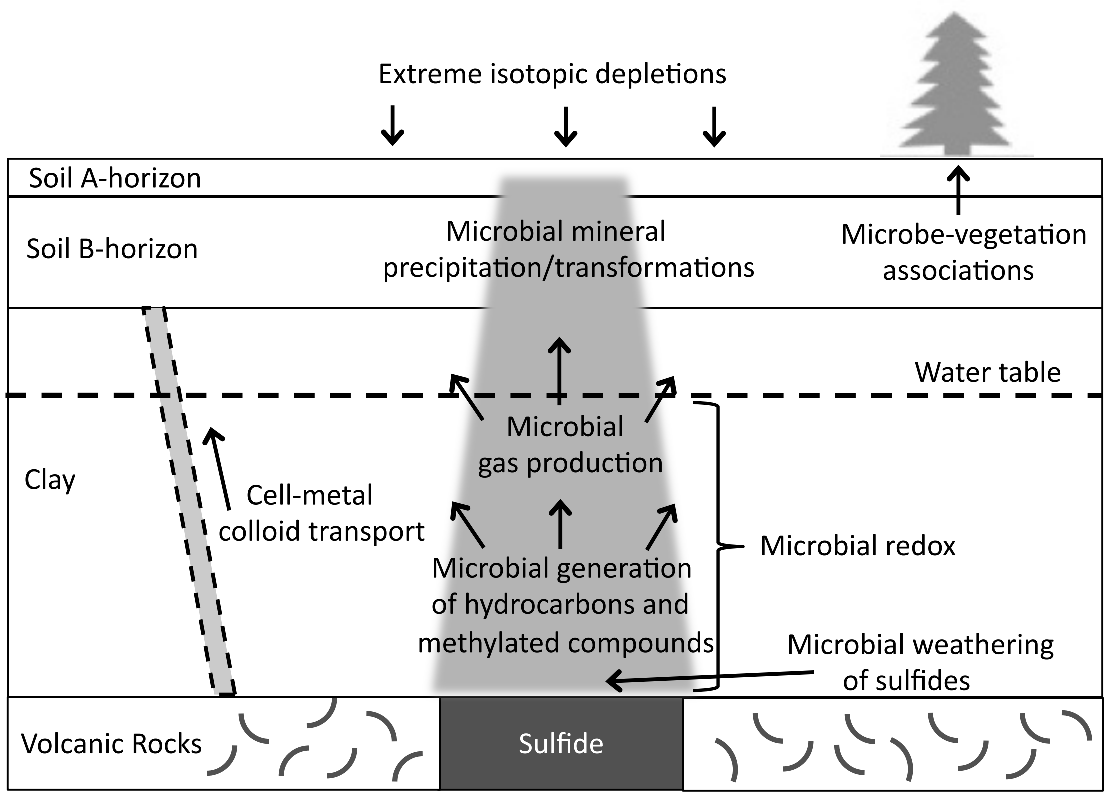


Figure 3: Microbial processes affecting secondary far field features above buried mineralization.

This research investigates the biogeochemical controls on metal mobility in the subsurface and soil anomaly development at the surface through field investigations and controlled laboratory experiments. As the microorganisms responsible for sulfide weathering in a non-arid terrain are currently unknown, field investigations in the subsurface at the Triple 7 Cu-Zn volcanogenic massive sulfide (VMS) mine in Flin Flon, Manitoba, Canada (Figure 4) were completed. Chapter 2 details the results of the microbial ecological investigation of the Cu-Zn VMS mineralization, and the extent of biogeochemical weathering of the deposit.

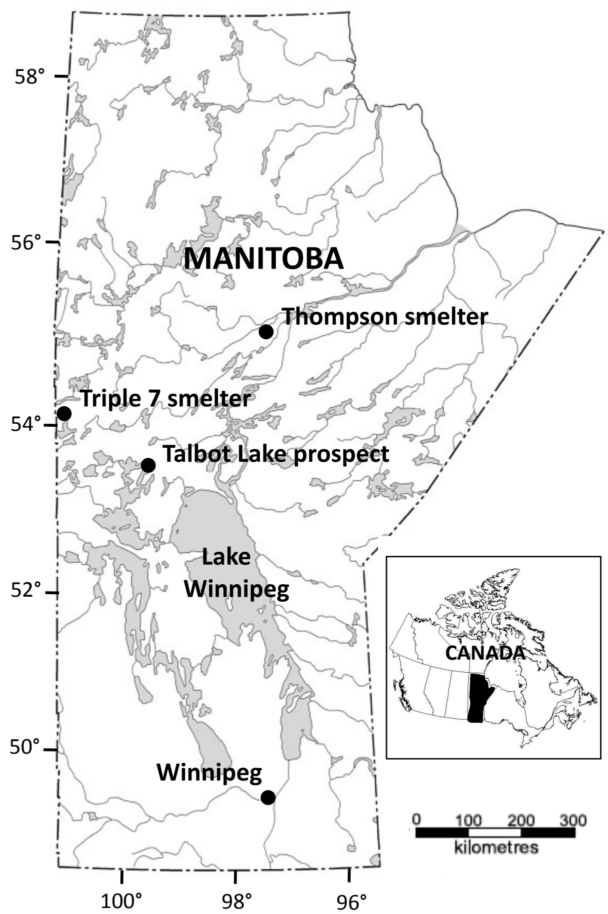


Figure 4: Location map of field investigation locations, Triple 7 mine and smelter and Talbot Lake prospect, Manitoba, Canada.

To investigate the microbial controls on the mechanisms of soil anomaly formation, a biogeochemical soil survey overlying a buried Cu-Zn VMS deposit in glaciated northern terrain was completed at the Talbot Lake prospect, Manitoba, Canada (Figure 4). Chapter 3 outlines the results of this survey, and correlates the soil microbial ecology to soil metal content and proximity to mineralization. This prospect was selected as the mineralization is similar to Triple 7 mine, but is located a significant distance from all smelters that can contaminate soil and vegetation. In addition, geochemical surveys delineating the soil and vegetation anomies overlying mineralization were previously completed (van Geffen et al., 2012a; van Geffen et al., 2012b).

To further deconstruct the results observed in the field investigations, material was collected from Triple 7 mine and Talbot Lake prospect and was then modeled in column flow-through experiments with controlled microbial communities. The aqueous and solid phase metal contents were determined in these experiments, and the results are described in Chapter 4. As the development of secondary far field features vary widely, especially depending on the deposit type and location (Cameron et al., 2004; Kelley et al., 2006), other deposit types were modeled in flow-through column experiments. Chapter 5 details the results from the Los Bronces Cu-porphyry deposit and Quabrada de los Arrieros prospect, Chile (Figure 5) and Appendix A outlines the results from a magmatic-Ni deposit in Quebec, Canada.

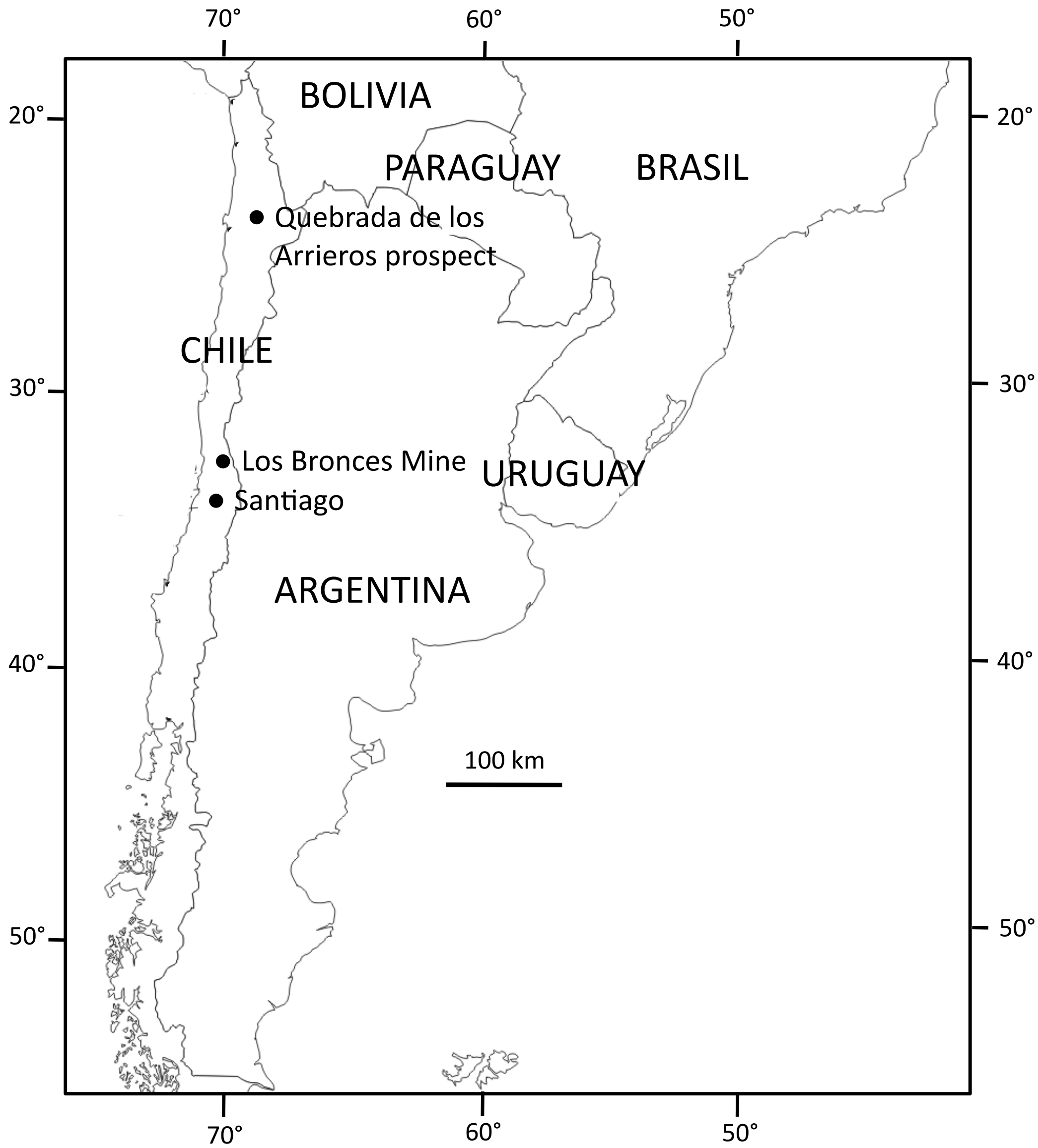


Figure 5: Location map of Los Bronces mine and Quebrada de los Arrieros prospect, Chile.

## REFERENCES


Alpers, C.N., Dettman, D.L., Lohmann, K.C., and Brabec, D., 1990, Stable isotopes of carbon-dioxide in soil gas over massive sulfide mineralization at Crandon, Wisconsin Journal of Geochemical Exploration, v. 38, p. 69-86.

Anand, R.R., Cornelius, M., and Phang, C., 2007, Use of vegetation and soil in mineral exploration in areas of transported overburden, Yilgarn Cration, Western Australia: a contribution towards understanding metal transportation processes: Geochemistry-Exploration Environment Analysis, v. 7, p. 267-288.

Bajc, A.F., 1998, A comparative analysis of enzyme leach and mobile metal ion selective extractions; case studies from glaciated terrain, northern Ontario: Journal of Geochemical Exploration, v. 61, p. 113-148.

Bawden, T.M., Einaudi, M.T., Bostick, B.C., Meibom, A., Wooden, J., Norby, J.W., Orobona, M.J.T., and Chamberlain, C.P., 2003, Extreme S-34 depletions in ZnS at the Mike gold deposit, Carlin Trend, Nevada: Evidence for bacteriogenic supergene sphalerite: Geology, v. 31, p. 913-916.

Cameron, E.M., Hamilton, S.M., Leybourne, M.I., Hall, G.E.M., and McClenaghan, M.B., 2004, Finding deeply buried deposits using geochemistry: Geochemistry-Exploration Environment Analysis, v. 4, p. 7-32.

Cameron, E.M., and Leybourne, M.I., 2005, Relationship between groundwater chemistry and soil geochemical anomalies at the Spence copper porphyry deposit, Chile: Geochemistry-Exploration Environment Analysis, v. 5, p. 135-145.

Enders, M.S., Knickerbocker, C., Titley, S.R., and Southam, G., 2006, The role of bacteria in the supergene environment of the Morenci Porphyry Copper Deposit, Greenlee County, Arizona: Economic Geology, v. 101, p. 59-70.

Fu, C.C., Yang, T.F., Walia, V., and Chen, C.H., 2005, Reconnaissance of soil gas composition over the buried fault and fracture zone in southern Taiwan: Geochemical Journal, v. 39, p. 427-439.

Gao, Y., Wang, M., and Zhang, D.-e., 2011, Application of 'metals-in-soil-gas' techniques to mineral exploration in exotic overburden: Geochemistry-Exploration Environment Analysis, v. 11, p. 63-70.

Gilliss, M.L., Al, T.A., Blowes, D.W., Hall, G.E.M., and MacLean, B., 2004, Geochemical dispersion in groundwater from a weathered Cu-Zn deposit in glaciated terrain: Geochemistry-Exploration Environment Analysis, v. 4, p. 291-305.

Hamilton, S.M., 1998, Electrochemical mass-transport in overburden: a new model to account for the formation of selective leach geochemical anomalies in glacial terrain: Journal of Geochemical Exploration, v. 63, p. 155-172.

Hamilton, S.M., Cameron, E.M., McClenaghan, M.B., and Hall, G.E.M., 2004a, Redox, pH and SP variation over mineralization in thick glacial overburden. Part I: methodologies and field investigation at the Marsh Zone gold property: Geochemistry-Exploration Environment Analysis, v. 4, p. 33-44.

—, 2004b, Redox, pH and SP variation over mineralization in thick glacial overburden. Part II: field investigation at Cross Lake VMS property: Geochemistry-Exploration Environment Analysis, v. 4, p. 45-58.

Kelley, D.L., Kelley, K.D., Coker, W.B., Caughlin, B., and Doherty, M.E., 2006, Beyond the obvious limits of ore deposits: The use of mineralogical, geochemical, and biological features for the remote detection of mineralization: Economic Geology, v. 101, p. 729-752.

Lollar, B.S., Lacrampe-Couloume, G., Slater, G.F., Ward, J., Moser, D.P., Gihring, T.M., Lin, L.H., and Onstott, T.C., 2006, Unravelling abiogenic and biogenic sources of methane in the Earth's deep subsurface: Chemical Geology, v. 226, p. 328-339.

Malmqvist, L., Kristiansson, K., and Kristiansson, P., 1999, Geogas prospecting - an ideal industrial application of PIXE: Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms, v. 150, p. 484-490.

Melchior, A., Dejonghe, L., and Hughes, G., 1996, A geomicrobiological study of soils collected from auriferous areas of Argentina: Journal of Geochemical Exploration, v. 56, p. 219-227.

Nelson, M., Kyser, K., Clark, A., and Oates, C., 2007, Carbon isotope evidence for microbial involvement in exotic copper silicate mineralization, Huinquintipa and Mina Sur, northern Chile: Economic Geology, v. 102, p. 1311-1320.

Parduhn, N.L., 1991, A microbial method of mineral exploration - A case-history at the Mesquite deposit Journal of Geochemical Exploration, v. 41, p. 137-149.

Polito, P., Kyser, K., Lawie, D., Cook, S., and Oates, C., 2007, Application of sulphur isotopes to discriminate Cu-ZnVHMS mineralization from barren Fe sulphide mineralization in the greenschist to granulite facies Flin Flon-Snow Lake-

Hargrave River region, Manitoba, Canada: Geochemistry-Exploration Environment Analysis, v. 7, p. 129-138.

Reith, F., McPhail, D.C., and Christy, A.G., 2005, Bacillus cereus, gold and associated elements in soil and other regolith samples from Tomakin Park Gold Mine in southeastern New South Wales, Australia: Journal of Geochemical Exploration, v. 85, p. 81-98.

Reith, F., and Rogers, S.L., 2008, Assessment of bacterial communities in auriferous and non-auriferous soils using genetic and functional fingerprinting: Geomicrobiology Journal, v. 25, p. 203-215.

Simonetti, A., Bell, K., and Hall, G.E.M., 1996, Pb isotopic ratios and elemental abundances for selective leachates from near-surface till: Implications for mineral exploration: Applied Geochemistry, v. 11, p. 721-734.

Smee, B.W., 1998, A new theory to explain the formation of soil geochemical responses over deeply covered gold mineralization in arid environments: Journal of Geochemical Exploration, v. 61, p. 149-172.

Southam, G., and Saunders, J.A., 2005, The geomicrobiology of ore deposits: Economic Geology, v. 100, p. 1067-1084.

van Geffen, P., 2011, Geochemical indicators of buried sulphide mineralisation under sedimentary cover near Talbot Lake, Manitoba: Kingston, Queen's University.

van Geffen, P.W.G., Kyser, T.K., Oates, C.J., and Ihlenfeld, C., 2012a, Evaluation of partial digests for soils to detect a deeply buried VMS Cu-Zn prospect in boreal forests: Manuscript submitted for publication.

—, 2012b, Till and vegetation geochemistry at the Talbot VMS Cu-Zn prospect, Manitoba, Canada: implications for mineral exploration: Geochemistry-Exploration Environment Analysis, v. 12, p. 67-86.

Wakelin, S., Anand, R.R., Macfarlane, C., Reith, F., Noble, R., and Rogers, S., 2012, Assessing microbiological surface expression over an overburden-covered VMS deposit: Journal of Geochemical Exploration, v. 112, p. 262-271.

# CHAPTER 2. FE (II)-OXIDIZING *MARINOBACTER* FROM THE DEEP CRUST ASSOCIATED WITH A MASSIVE SULFIDE ORE DEPOSIT

Submitted as separate article:
Leslie, K., Sturm, A., Stotler, R.L., Oates, C.J., Kyser, T.K., and Fowle, D.A. (2012) Isolated Fe (II)-oxidizing *Marinobacter* associated with a massive sulfide ore deposit affects metal mobility in the deep subsurface. Manuscript in review at GCA.

ABSTRACT

A geomicrobiological investigation was completed at a depth of 1.4 km, in the Triple 7 Cu-Zn mine (Flin Flon, Canada). The saline groundwater emanating from boreholes at that depth contained a microbial community consisting of two organisms: *Flexibacter tractuosus* and *Marinobacter* spp. Isolates of the neutrophilic, halophilic *Marinobacter* spp. were obtained, and it was demonstrated to be capable of organotrophic growth (anaerobically and aerobically) and lithotrophic growth on Fe (II) with $O_2$ and $NO_2$.

To examine biogeochemical trace metal cycling in this deep subsurface setting, incubation experiments were carried out with the Fe (II)-oxidizing *Marinobacter* isolate and mineralized (metal-containing ore) material in batch and column flow-through settings. The activity of the *Marinobacter* isolate resulted in an increase in the mobilization of major elements (Fe, S) and trace metals (Cu, Zn) from the solid ore material. These results indicate that the microbial activity of organisms indigenous to the deep subsurface affects the mobilization of Fe and trace elements, and that Fe (II)-oxidation may be an important biogeochemical process in the deep subsurface.

# INTRODUCTION

The deep terrestrial biosphere provides the opportunity to expand our understanding of microbial ecology, mechanisms of adaptation, and the linkages between geochemistry and microbial metabolisms (Sahl et al., 2008). Ecological studies of deep boreholes and fractures have demonstrated that the deep biosphere is highly variable with diverse groups of microorganisms utilizing metabolisms dependent upon the host rock and water geochemistry (Gihring et al., 2006; Kieft et al., 2005; Lin et al., 2006; MacLean et al., 2007; Onstott et al., 2003; Sahl et al., 2008). While many novel mechanisms based on geochemically derived sources have been proposed to sustain microbial communities in the deep subsurface (Kieft et al., 2005; Krumholz, 2000; Lin et al., 2006; Moser et al., 2005), organisms capable of Fe (II)-oxidation have only recently received attention (Rastogi et al., 2010; Swanner et al., 2011).

Organisms capable of Fe (II)-oxidation at circumneutral pH and microaerophilic or anoxic conditions have been cultured from shallow terrestrial environments, including groundwater streams (Emerson and Moyer, 1997) and wetlands (Sobolev and Roden, 2001) and deep marine environments (Emerson et al., 2010; Rastogi et al., 2010), specifically sulfide hydrothermal systems (Edwards et al., 2003; Rogers et al., 2003). It has been documented that sulfur and iron oxidizing organisms significantly increase the rate of oxidation of sulfides in acidic, oxidizing conditions (Southam and Saunders, 2005). However, as the sulfur and iron oxidizing organisms that utilize metabolisms under circumneutral pH, at the oxic-anoxic boundary (Emerson and Moyer, 1997) or anoxic conditions (Straub et al., 1996) have been difficult to identify and isolate, their impact upon oxidation and weathering of sulfides is not fully understood.

Sampling in the deep subsurface poses unique challenges, as mining activities can introduce non-indigenous microorganisms (Moser et al., 2005). In many studies, however, it has been found that introduced microbes fail to persist (Moser et al., 2005; Moser et al., 2003; Onstott et al., 2003; Pedersen et al., 1997), especially in artesian fractures and boreholes that have continuous unidirectional flushing of groundwater (MacLean et al., 2007). These fractures and boreholes can be viewed as conduits into native deep subsurface habitats (Moser et al., 2005).

These results are from such an artesian borehole in Triple 7 mine, an active copper/zinc mine with a depth >1500 meters. This mine is located in the town of Flin Flon, Manitoba, Canada, in the Flin Flon belt, one of the largest Palaeoproterozoic volcanic-hosted massive sulfide (VHMS) districts in the world (Figure 1). Two large, stacked massive sulfide lenses, one comprising fine, banded pyrite and sphalerite and the other chalcopyrite, pyrrhotite, pyrite and magnetite, make up the deposit (Polito et al., 2007). This research was conducted with the aim of identifying organisms associated with buried sulfide deposits, and determining their effect upon metal mobility and ore weathering in the deep subsurface.

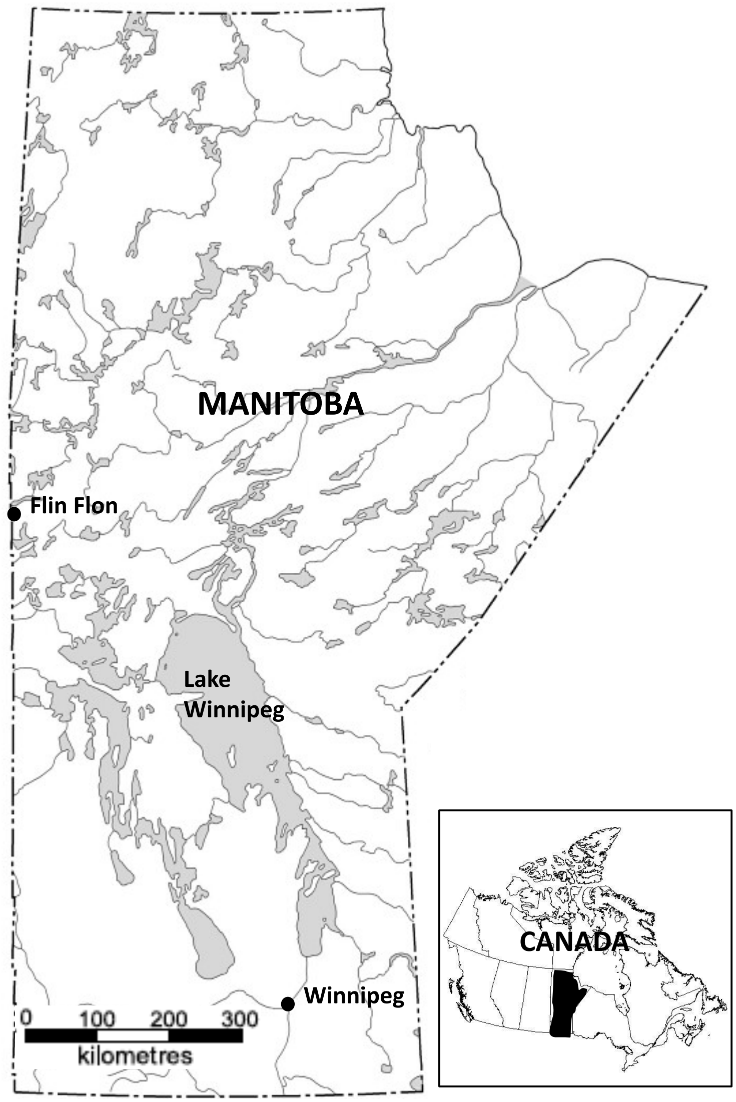


Figure 1: Location map of Triple 7 mine, Flin Flon, Manitoba, Canada.

## METHODS

### *Sampling*

Water and biofilm sampling was completed in May and September 2008 at a depth of approximately 1400m from several unsealed free-flowing boreholes that had been drilled into the massive sulfide lens (chalcopyrite, pyrrhotite, pyrite and locally near-massive magnetite) approximately one year prior to sampling (Figure 2). Water was collected from the boreholes for microbiological and geochemical analyses. On site measurements of pH and temperature were completed with hand-held probes (Accumet AP62). For gas headspace analysis by GC (Agilent Technologies Network GC System 6890N with Thermal Conductivity Detector) water was collected in sealed bottles. Aliquots for cations, anions, total organic carbon and alkalinity were collected and analyzed at ACME Analytical Laboratories (Vancouver, Canada). Separate aliquots were sent to Queen's University (Kingston, Canada) for isotopic analyses ($\delta^2H$ and $\delta^{18}O$). Approximately 2 liters of borehole water was collected and filtered on-site using 0.2μM polycarbonate filters. The filters were preserved by either freezing at -20°C or storage in 90% Ethanol, transported on ice, and stored at -80°C until analysis. Enrichment media were prepared and transported to the field for direct inoculation with collected borehole water. Solid biofilm material from both the white and red-brown precipitate was aseptically collected, transported on ice, and stored at -80°C prior to subsequent analyses.

*Geochemical characterization*

Water samples were sent to ACME Analytical Laboratories (Vancouver, Canada) for cation, anion, total organic carbon, and alkalinity, and to Queen's University (Kingston, Canada) for isotopic analyses ($\delta^{18}O$ and $\delta^2H$). Water samples were also analyzed by ICP-OES (Perkin Elmer Optima 5300DV) at the University of Kansas. Water samples were filtered with 0.45μm polycarbonate filters and acidified to 2% with Trace Metal Grade nitric acid at the time of collection. Samples were diluted to 100 and 1000 times and certified seawater standard (CRM-SW) was used as an external calibration.

Figure 2: Triple 7 borehole at 1400m that was sampled May and September 2008. Biofilm samples were collected from the areas of both white and red-brown precipitates.

Characterization of the solid phases was completed at the University of Kansas. The white precipitate forming at the mouth of the boreholes was collected and dissolved with 10% Trace Metal Grade nitric acid and analyzed by ICP-OES. The red-brown precipitate was dissolved using a sequential extraction developed for the characterization of Fe-oxides (Poulton and Canfield, 2005). Briefly, 200mg of solid, 10ml of extraction fluid and constant agitation was used for all extraction steps.

Samples were centrifuged and washed between all extraction steps. The extraction fluids used were as follows: DI (surface sorption), $MgCl_2$ (surface sorption), Na acetate pH 4.5 (Carbonate Fe, including siderite and Ankerite), Hydroxylamine-HCl (Ferrihydrite), Dithionite (Goethite, Hematite), Oxalate (Magnetite), and 12N HCl (Poorly reactive silicate Fe). All extraction fluids were diluted and analyzed by ICP-OES (Perkin Elmer Optima 5300DV).

*Molecular Analyses*

Molecular analyses were completed on portions of the filters and solid biofilm material using protocols described elsewhere (Crowe et al., 2011). Briefly, DNA was extracted using a MoBio PowerSoil extraction kit (MO BIO Laboratories, Carlsbad, CA, USA). The extracted 16S rDNA was amplified using polymerase chain reaction (PCR) with Platinum Taq polymerase and general Bacterial and Archaeal primers (27f/1492r, 27fa/1492r). PCR cycles were completed following the specifications given by Invitrogen (Carlsbad, CA, USA) for Platinum Taq polymerase (Appendix C), and included positive and negative controls. The resultant PCR products were imaged by gel electrophoresis to determine positive amplification and to estimate the length of the amplified fragments. The amplified DNA was cloned into the TOPO cloning vector and transformed into chemically competent One Shot TOP10 E. coli. Individual clone colonies were randomly selected for sequencing after blue-white β-galactosidase screening to confirm positive ligation. Plasmid DNA was purified using a PureLink Quick plasmid Miniprep Kit (Invitrogen, Carlsbad, CA, USA). Macrogen (Rockville, MD, USA) completed forward and reverse sequencing of the purified

DNA, and sequences were assembled using the assembly function in Geneious (Auckland, New Zealand). BLAST (Basic Local Alignment Search Tool) was used to identify the clones, and chimeric sequences were identified with Bellerophon (v.3) and eliminated from the dataset. Additional sequences were used from the Greengenes database, and sequence alignments were performed using the MUSCLE plugin in Geneious. Phylogenetic trees were constructed by neighbor-joining, maximum likelihood, and Bayesian inference methods using the Geneious tree builder, and the PHYML (Guindon & Gascuel, 2003) and MrBAYES (Huelsenbeck & Ronquist, 2001) plugins, respectively (data not shown). Sequences were submitted to Genbank (accession number JN791444).

*Isolation and Culturing*

Several media types were prepared for the isolation of microorganisms from the subsurface (Appendix D), including: sulfate reducers (DSZM medium 63), iron reducers (ATCC medium 1768), sulfur and iron oxidizers (ATCC medium 2039, DSMZ Medium 70, DSMZ Medium 71), and methanogens (DSZM medium 814). Secondary medias in both liquid and solid form were prepared for secondary inoculation in the laboratory. These medias were based on the Artificial Seawater (ASW medium), and supplemented with 1mM of various forms of organic carbon (pyruvate, acetate, and yeast).

Gradient tubes for the isolation of Fe (II)-oxidizing bacteria were prepared as previously described using the saltwater microaerophilic lithotrophic medium with FeS iron source (Emerson and Floyd, 2005). Briefly, FeS was prepared by mixing

$Na_2S$ and $FeSO_4$ and washing with DI until the pH was circumneutral. Gradient tubes were prepared by making a 1% agar FeS plug, overlain by a 0.15% artificial seawater layer. Following development of a Fe (III)-oxide band in inoculated tubes, $O_2$ was measured using microelectrodes (Emerson and Moyer, 1997). The working electrode was constructed in the lab, with 100μm gold amalgam (Au/Hg) in a 5mm glass tube drawn out to a 0.2–0.3mm tip (Druschel et al., 2008). An Ag/AgCl reference electrode and a platinum counter electrode were placed in the top of the ASW layer, and the working electrode was mounted on a one-axis micromanipulator operated by hand to descend in increments between 0.5 and 2mm for each sampling point (Druschel et al., 2008). The microelectrode was calibrated with ambient air to indicate percent air saturation of $O_2$, and with a detection limit of approximately 0.1% saturation (Sobolev and Roden, 2001). Voltammetric measurements were conducted with a DLK potentiostat (AIS Instruments, Flemington, NJ, USA), QuadStat, and electronic data recorder (eDAQ, Denistone, Australia). Cyclic voltammetry was performed in triplicate at each sampling point in the profile (Druschel et al., 2008).

Anaerobic bottle cultures for the isolation of Fe (II)-oxidizing bacteria were prepared as previously described using the saltwater anaerobic lithotrophic nitrate reducer medium with FeS iron source (Emerson and Floyd, 2005). Anaerobic techniques were used during the preparation of the medium, and inoculated following numerous isolations in liquid and on solid media. Sub-samples of the medium were taken at specific time intervals, phosphate buffer (500mM) was added to scavenge Fe, and centrifuged to pellet the precipitates. The $HS^-$, $NO_2^-$ and $NO_3^-$

contents were quantified in the supernatant by spectrophotometric methods: Methylene blue method (Spectronic GENESYS 20 spectrophotometer), Sulfanilimide method (Spectronic GENESYS 20 spectrophotometer), and UV screening method (World Precision Instruments, Ocean optics liquid capillary waveguide cell), respectively (APHA, 1989). The pellet was dissolved with 1M HCl, and total Fe content was determined by ICP-OES (Perkin Elmer Optima 5300DV), while Fe (II) and Fe (III) were quantified by Ferrozine (Spectronic GENESYS 20 spectrophotometer) (Viollier et al., 2000).

*Ore Weathering and Metal Mobility*

Flow-through columns (15 x 5cm) were wet packed with Triple 7 ore material that had been crushed and sieved to <250μm. Artificial water, containing approximately 1mM dissolved salts (NaCl, $CaCl_2$, $NaHCO_3$, $MgCl_2$, $K_2SO_4$), less than 0.1mM organic carbon (pyruvate, acetate, lactate), with a circumneutral pH was pumped through the columns at a rate of approximately 10ml/day. The microbial community was the only variable adjusted between columns and included: a control (no added organisms), the Triple 7 isolate, a model sulfur oxidizer (*Acidithiobacillus thiooxidans*) and a microbial consortia consisting of a model methanogen (*Methanobacterium formicicum*), sulfate reducer (*Desulfovibrio desulfuricans*), iron reducer (*Geobacter metallireducens*), sulfur oxidizer (*Acidithiobacillus thiooxidans*) and the Triple 7 isolate. Column effluents were collected daily, filtered with 0.45μm polycarbonate filters, and analyzed by ICP-OES (PerkinElmer Optima 5300DV). At the termination of the experiment, subsamples of the solid material was dried and subjected to two extractions (0.5M MgCl and 0.5M HCl). The extracts were filtered, diluted and analyzed by ICP-OES (PerkinElmer Optima 5300DV).

Batch experiments were completed with the same Triple 7 crushed ore material, the Triple 7 Marinobacter isolate and artificial water with 20% salinity ($NaCl$, $CaCl_2$, $MgCl_2$, $K_2PO_4$, $KCl$, $(NH_4)SO_4$, $MgSO_4$). Controls and isolate inoculations were each completed in triplicate under anaerobic conditions. After three months the aqueous phase was sub-sampled, filtered, and analyzed by ICP-OES (PerkinElmer Optima 5300DV).

## RESULTS AND DISCUSSION

### *Geochemical Characterization*

The pH and temperature of the borehole water was 6.2 and 30°C. The fluid was high in salinity (12.6%), low in alkalinity (3mg/L) and total organic carbon (4ppm), with relatively high concentrations of chloride (2.2M), bromide (9.8mM), sulfate (7.5mM), nitrate (7.7mM), and dissolved metals Mn (470μM), Fe (20μM), and Zn (3μM). The gas emissions from the fluid were predominately $CO_2$. The stable isotopic composition of the water was $\delta^2H_{VSMOW}$ = -101 and $\delta^{18}O_{VSMOW}$ = -16.3 (Figure 3), indicating that the water emanating from the borehole is similar in origin to brines from the crystalline rocks of the Canadian Shield, and mixing with shallow fresh water or waste water from mining activities has not occurred (Frape et al., 2004; Stotler, 2009, 2012).

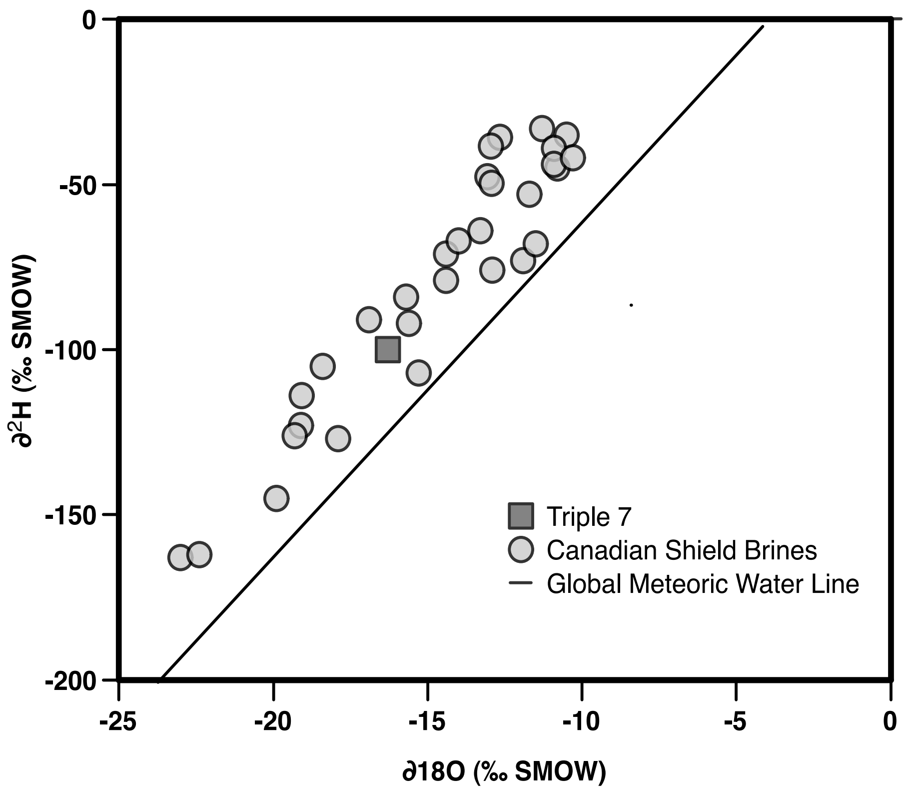


Figure 3: Isotopic composition ($\delta^{18}O$ vs. $\delta^{2}H$) of Triple 7 mine water relative to other Canadian Shield brines (Frape et al, 2004) and the global meteoric water line (GMWL).

The precipitates forming at the mouth of the boreholes were characterized to reflect the mineralogical and elemental composition of secondary minerals that will precipitate as the water flowing from buried ore encounters an oxic environment. These near-surface precipitates are used as indicators in the exploration for buried mineral deposits (Britt, 2001; Noble, 2011). The white precipitate forming above the mouth of the boreholes was gypsum ($CaSO_4$), halite (NaCl) and calcite ($CaCO_3$). Using a sequential extraction scheme designed to characterize Fe minerals (Poulton and Canfield, 2005), it was found that the Fe-precipitates are predominately ferrihydrite (85 wt%) and Fe-carbonate (8 wt%) (Figure 4). The ferrihydrite mineral phase contains the majority of the solid-associated Zn (54% of the total 282 ppm) (Figure 5a), whereas Cu in the Fe-mineral phases is found predominately in the Fe-carbonate (60% of the total 13 ppm) (Figure 5b). Considering that these specific boreholes had been flowing for only 1 year prior to sampling, these results confirm that significant metal and mineralogical anomalies will develop along the groundwater flow-path overlying buried mineralization.

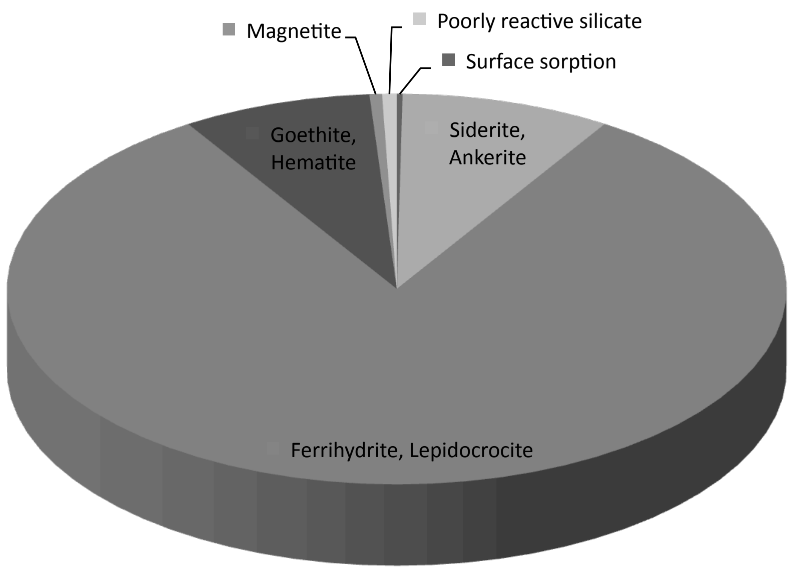


Figure 4: Mineral composition of Fe-precipitate as determined by sequential extractions: Surface sorption (0.2%), Siderite/Ankerite (7.8%), Ferrihydrite/Lepidocrocite (84.2%), Goethite/Hematite (6.8%), Magnetite (0.5%), poorly reactive silicate (0.5%).

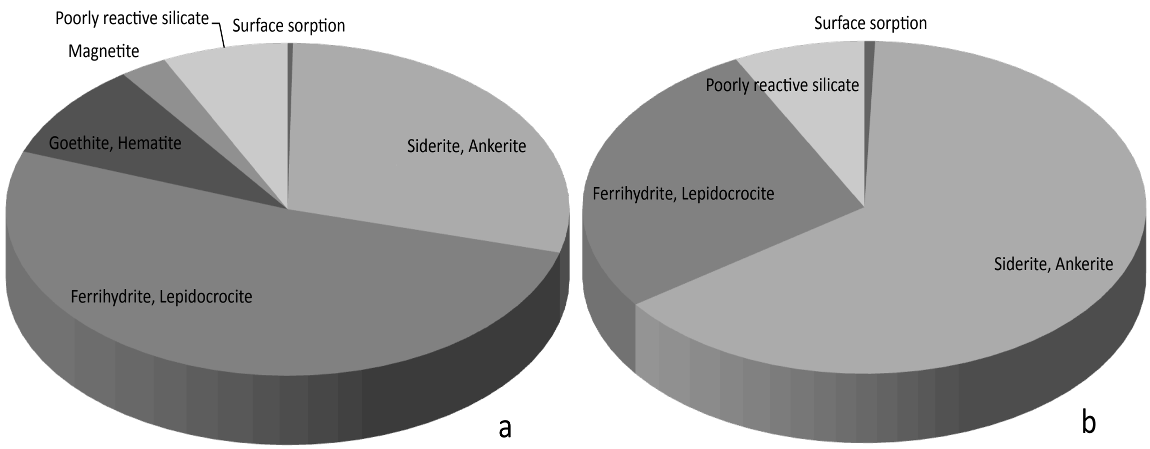


Figure 5: (a) Distribution of total Zn (282ppm) and (b) distribution of total Cu (13ppm) in Fe mineral precipitate phases.

*Geomicrobiology*

Investigations of the microbial ecology of the site via molecular analyses on the water collected suggest that only two organisms were present in the aqueous phase: *Flexibacter tractuosus* and *Marinobacter spp*. Molecular analyses on the solid biofilm (Fe-precipitate) indicate the presence of only *Marinobacter spp*. The presence of a community with such low biodiversity supports the conclusion that both organisms are probably indigenous (Chivian et al., 2008; Gihring et al., 2006). It has been documented that introduced microbes fail to persist in the deep subsurface, especially in this situation where there has been unidirectional flushing of groundwater (MacLean et al., 2007; Moser et al., 2005; Moser et al., 2003). As *Marinobacter* and *Flexibacter tractuosus* are both commonly of saline fluids, particularly marine, and considering the high salinity of the aqueous phase, it is unlikely that the presence of either organism is the result of contamination.

All species of the *Marinobacter* genus are capable of heterotrophic metabolisms from the breakdown of a wide variety of organic carbon (Gauthier et al., 1992; Huu et al., 1999), and some species are capable of Fe (II)-oxidation (Edwards et al., 2003). Growth was detected in several media types including those typical of sulfate reducers (DSZM medium 63), iron reducers (ATCC medium 1768), iron oxidizers (ATCC medium 2039), and methanogens (DSZM medium 814). All these medias (except for the iron oxidizers) contained organic carbon and are anoxic. Molecular analyses demonstrated that only the *Marinobacter spp.* was present in all the media types. The secondary medias that were prepared, based on artificial seawater (ASW medium) and supplemented with 1mM of various forms of organic carbon, sustained more microbial growth than the isolation medias.

The *Marinobacter* isolate demonstrated the capability to grow on a varied source of organic carbon, both anaerobically and aerobically. The ability to grow lithotrophically on Fe (II) in circum-neutral, microaerophilic conditions was confirmed by the development of a Fe (III)-oxide layer at the anoxic-oxic boundary determined by microelectrodes in agar-stabilized gradient tubes (Figure 6). As many species that are capable of aerobic Fe (II)-oxidation can also anaerobically couple Fe (II)-oxidation to nitrate reduction (Straub et al., 2001), anaerobic bottle cultures were also tested. The saltwater anaerobic nitrate reducer media with an FeS iron source (Emerson and Floyd, 2005) inoculated with the isolate resulted in nitrate reduction (Figure 7), with the production of nitrite and $N_2O$ and the consumption of $CO_2$. After 70 days approximately 20% of the total Fe (II) had been oxidized relative to the controls and Fe (III) oxides could be visibly seen precipitating in the inoculated culture bottles. This indicates that the *Marinobacter* isolate is capable of lithotrophic Fe (II)-oxidation coupled to nitrate reduction, albeit at a significantly slower rate than previously documented (Straub et al., 1996). The isolate's ability to oxidize Fe (II) both aerobically and anaerobically supports the conclusion that the organism and its metabolism are indigenous and not the result of the interaction of oxygen along the borehole.

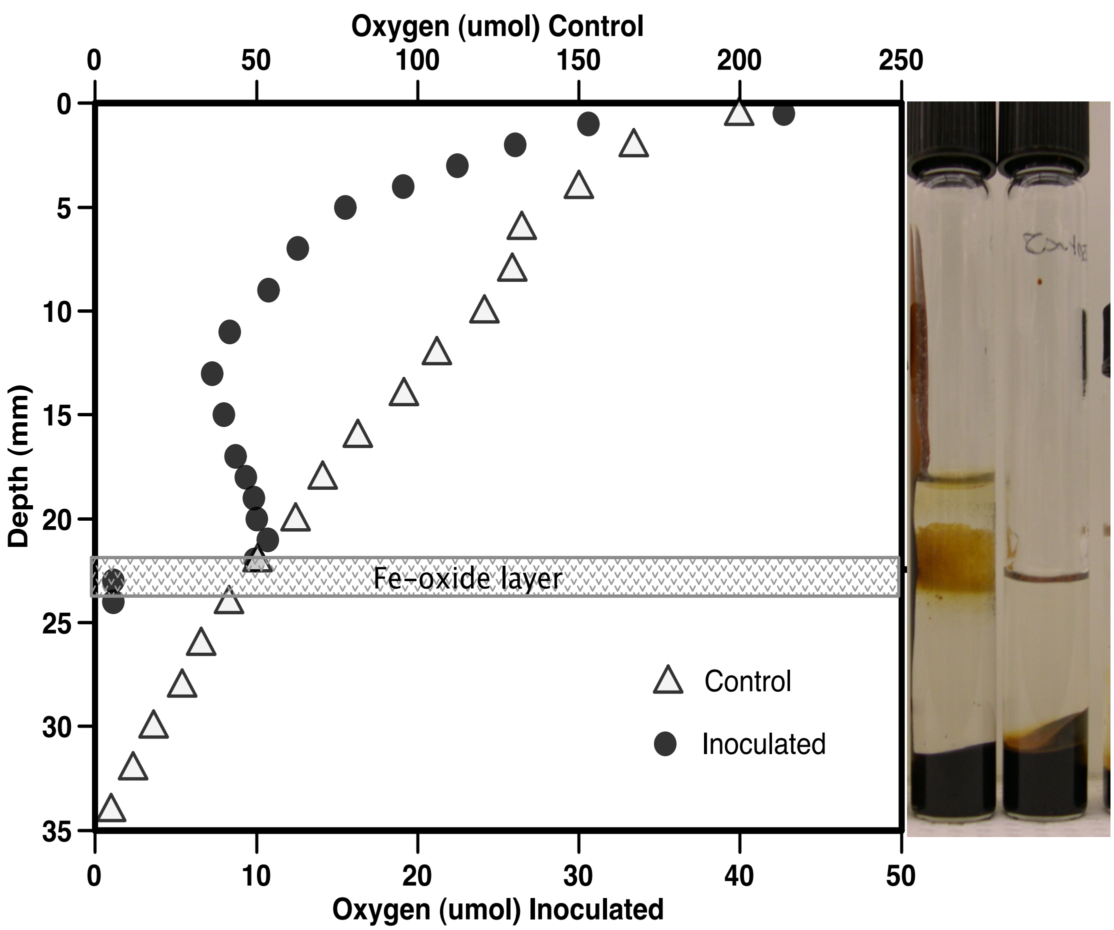


Figure 6: Oxygen profile in oxic Fe (II)-sulfide gradient tubes (replicate data not shown) and growth/development of the Fe (III) oxide layer. Left tube was inoculated with *Marinobacter* isolate, right tube is sterile control.

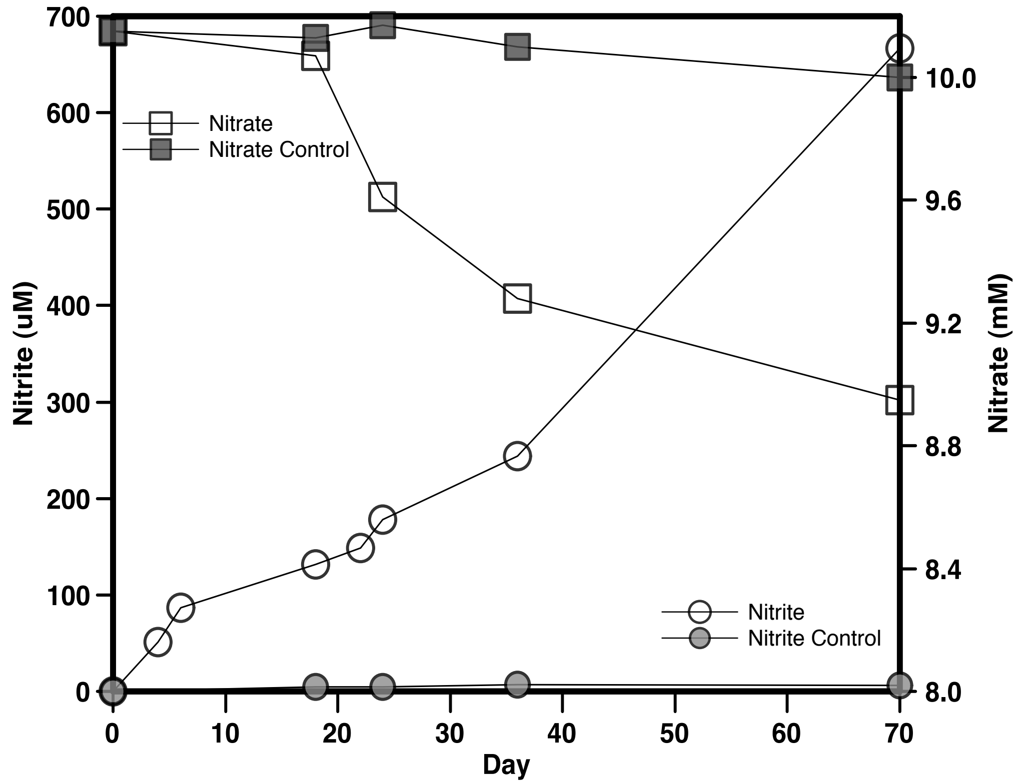


Figure 7: Nitrate consumption and nitrite generation in anaerobic Fe (II) sulfide bottle cultures over experimental time. Approximately 20% of the Fe (II) was oxidized to Fe (III) over this time interval.

Microbial communities in the deep subsurface have been shown to play an important role in cycling carbon and potentially metals (Kelley et al., 2006; Lollar et al., 2005). Fe (II) oxidizers have been implicated in extreme weathering of ore deposits (Southam and Saunders, 2005), however, they have been considered only in oxic environments, influencing subsurface conditions by consuming $O_2$ and maintaining reducing conditions (Kelley et al., 2006). The isolation of an organism in the deep subsurface capable of Fe (II) oxidation under both anoxic and oxic conditions at circumneutral pH suggests that metal mobility and weathering of buried ore deposits may be enhanced by indigenous microbial communities.

*Ore Weathering and Metal Mobility*

To directly connect the microbial activity of the isolated microorganism to field-scale processes, flow-through column experiments were completed. To simulate water-rock interaction, the ore material was exposed to a constant fluid flow. The effect of microbial activity was examined by controlling the type of organisms and metabolisms introduced to individual flow-through columns. There were four microbial introduction designs: the Fe oxidizing *Marinobacter* isolate only (isolate); *Acidithiobacillus thiooxidans* only, which is a model S-oxidizing organism (sulfur oxidizer); a mixed culture consisting of both the isolate and S-oxidizer as well as a methanogen, sulfate reducer, and iron reducer (mixed culture); and a natural control where no organisms were introduced (natural control).

In all columns containing microorganisms (sulfur oxidizer, isolate, mixed culture) there was enhanced liberation of Zn from the ore, compared to the control (Figure 8). Both the sulfur oxidizer and isolate columns had initial Zn concentrations in the effluent of approximately 1,400μmol. The Zn concentration in the Isolate column effluent decreased to, and stayed at, 40μmol after 30 days, while Zn in the sulfur oxidizer column maintained higher concentrations until dropping to 5μmol after 75 days. The Zn concentration in the mixed culture column started at 400μmol, and very steadily decreased to 80μmol. The Zn concentration in the control column effluent never reached a concentration higher than 20μmol.

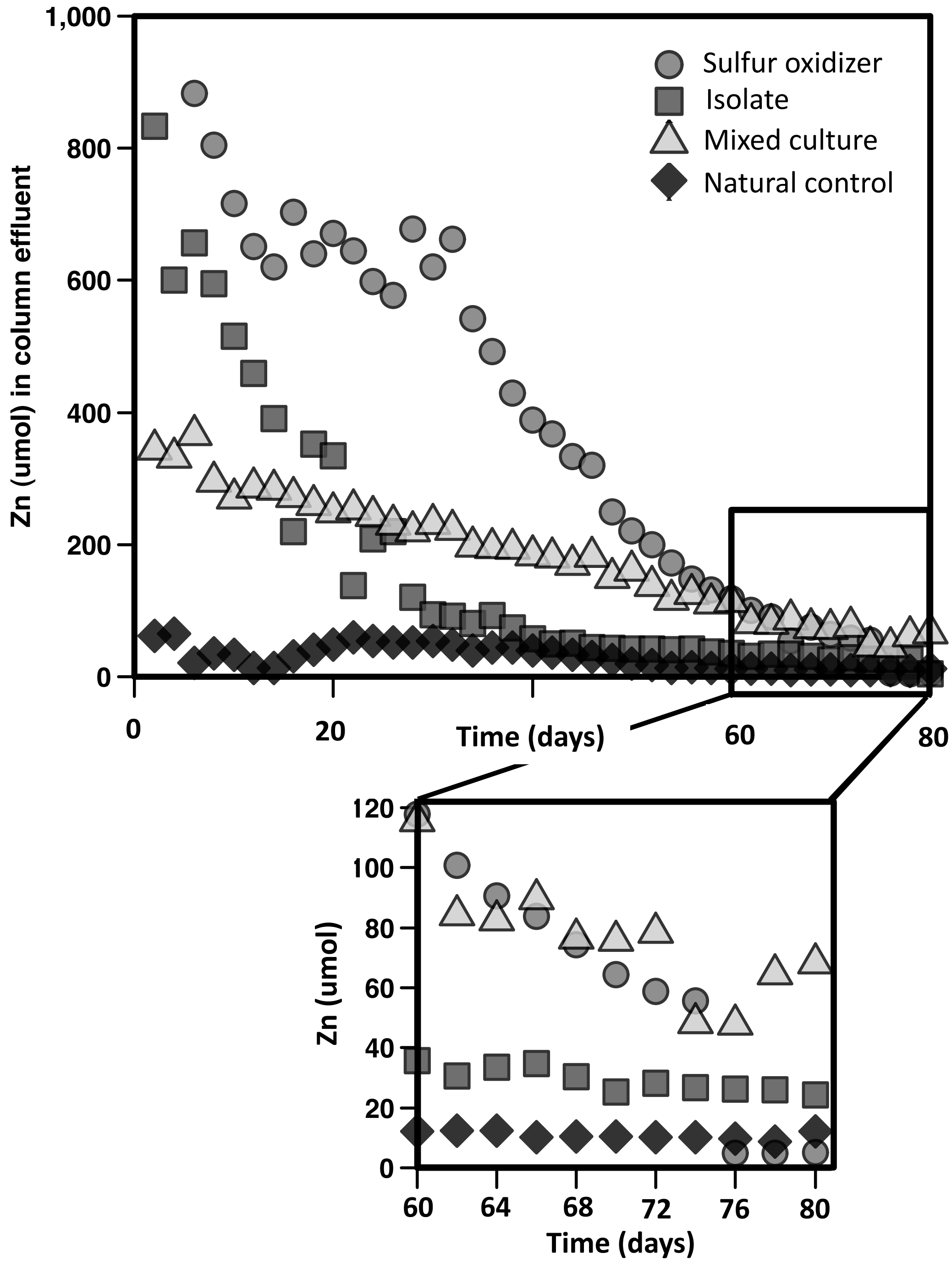


Figure 8: Zinc concentration in the effluent from Triple 7 ore columns of Triple 7ore. Three columns were inoculated (sulfur oxidizer only, isolate only, and mixed consortia) and one served as a natural control.

These results demonstrate that the activity of microorganisms, including those present in the indigenous microbial community, increase the rate of weathering of ore and subsequent release of metals. Even though the Fe- and S-oxidizing organisms are present in the mixed culture column, the concentration of Zn in the effluent does not follow the same pattern as the single-organism columns. It is possible that the initial release of Zn in the single organism columns was toxic, and was responsible for the subsequent rapid decrease of Zn in the effluent. The activity of the other organisms present in the mixed culture could have precipitated minerals that bound Zn and other toxic elements. Indeed, sulfate reducers generate sulfide that readily binds Fe, Zn, Cu and Pb, and have been documented to be responsible for secondary precipitation and metal concentration in the subsurface (Southam and Saunders, 2005). Likewise, the Marinobacter isolate precipitates Fe (III) oxides as a product of both microaerophilic and anaerobic Fe (II) oxidation, which may co-precipitate and absorb some of the metals released from the ore.

To test this hypothesis, an HCl extraction was completed on the solid phase at the termination of the column flow-through experiments to quantify the metals associated with secondary Fe-mineral precipitates due to microbial activity (Figure 9). Evidence of enhanced microbial secondary mineral precipitation was not found, as Fe, Cu and Zn were depleted in the HCl-extractable phase of the mixed culture column compared to all other columns as well as the original material. While it is generally understood that microbial secondary precipitation generates solids that are much more reactive, and therefore, should be HCl-extractable, it has also been documented that Fe and S cycling in the presence of heavy metals can form Fe-oxides and sulfides that are much more resistant (Lovely, 1987; Sitte, 2010; Sturm, 2008). Considering the lower but constant concentration of Zn in the effluent and the depletion of both Zn and Fe in the HCl-extractable phase, it is likely that enhanced Fe and S cycling is occurring in the mixed culture column.

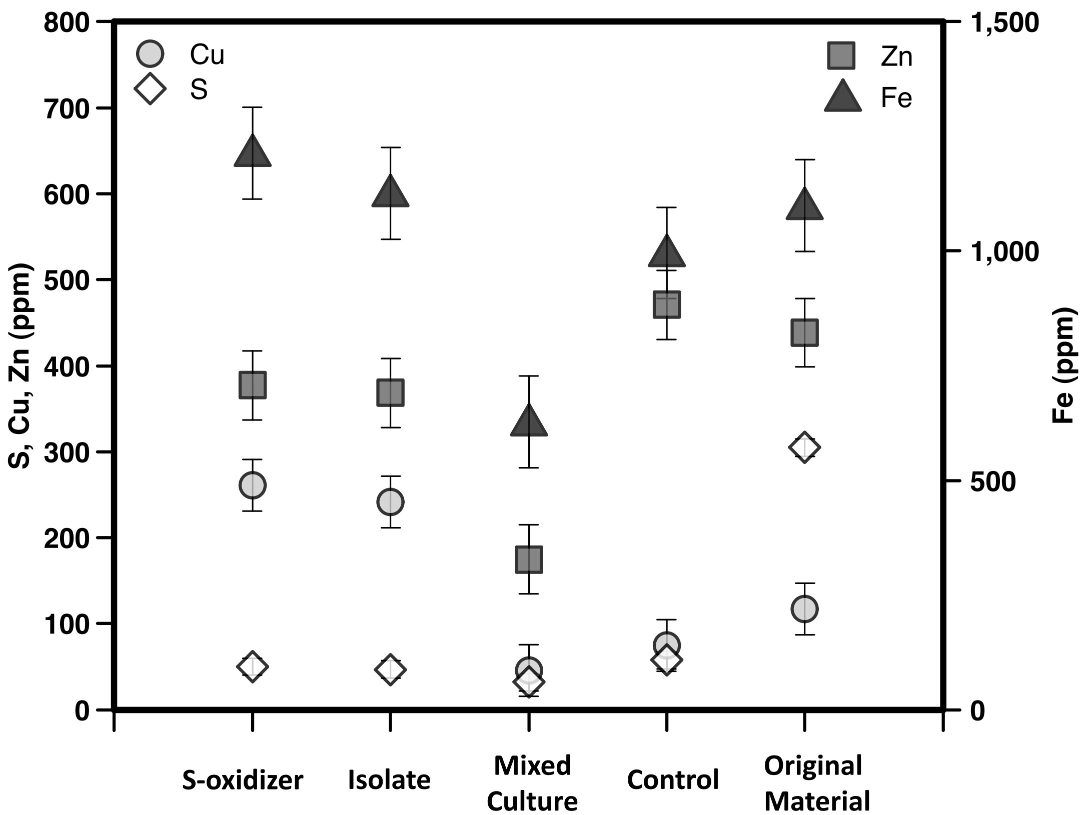


Figure 9: Elemental concentrations in HCl extraction after the termination of the flow-through column experiments.

Batch experiments with the Fe-oxidizing *Marinobacter* isolate and the ore materials were done to examine metal mobility from microbial activity, rather than just physical fluid flow. All elements were enriched in the batch experiments inoculated with the *Marinobacter* isolate, relative to the control, with the exception of P and K (Figure 10). Depletion of P and K is most likely due to sequestering of these elements into microbes, as microorganisms require P for cell maintenance, and some halophiles utilize K to maintain osmotic pressure. The enrichment of all the other elements confirms that the activity of microorganisms increase the rate of weathering of ore and mobility of elements.

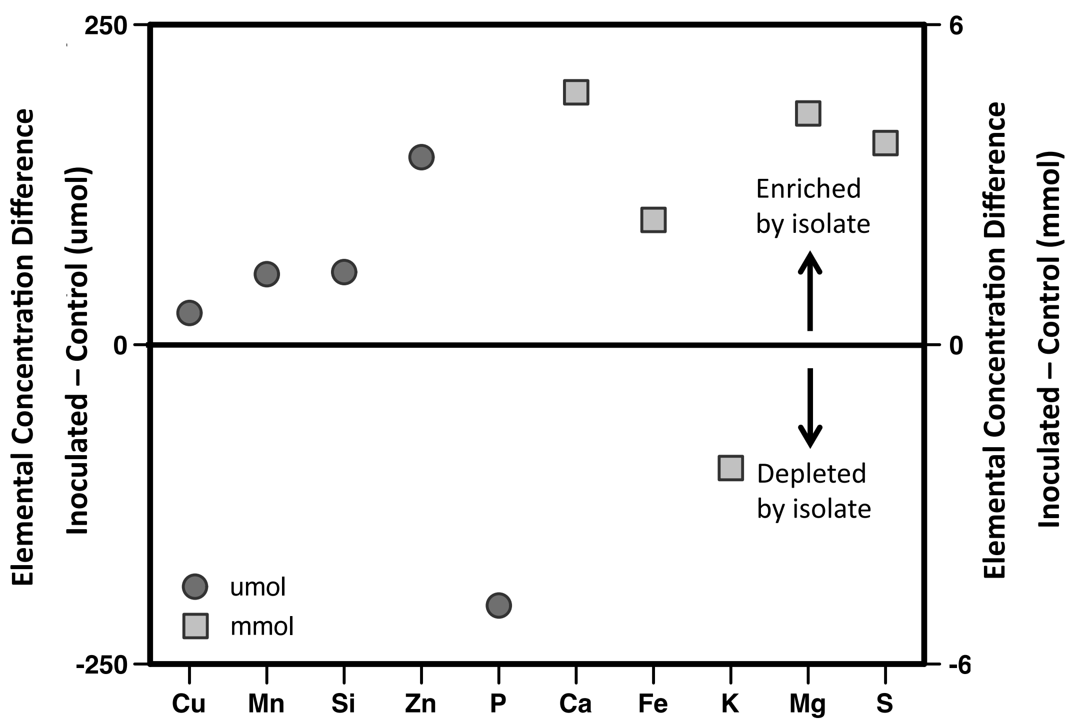


Figure 10: Elemental concentrations in a surface based extraction (MgCl) and amorphous mineral extraction (0.5M HCl) after the termination of the flow-through column experiments.

# CONCLUSION

These results document the discovery and cultivation of an organism in the deep terrestrial subsurface capable of lithotrophic circumneutral Fe (II)-oxidation under both oxic and anoxic conditions. This suggests that Fe (II)-oxidation is an important biogeochemical pathway occurring in the deep subsurface. This microbial activity enhances the rate of weathering and oxidation of buried sulfide ore, the mobilization of metals and subsequent near-surface geochemical and mineralogical anomaly development.

## REFERENCES


APHA, 1989, Standard methods for the examination of water and wastewater: Washington, DC, American Public Health Association.

Britt, A.F., Smith, R.E., and Gray, D.J., 2001, Element mobilities and the Australian regolith - a mineral exploration perspective: MARINE AND FRESHWATER RESEARCH v. 52, p. 25-39.

Chivian, D., Brodie, E.L., Alm, E.J., Culley, D.E., Dehal, P.S., DeSantis, T.Z., Gihring, T.M., Lapidus, A., Lin, L.H., Lowry, S.R., Moser, D.P., Richardson, P.M., Southam, G., Wanger, G., Pratt, L.M., Andersen, G.L., Hazen, T.C., Brockman, F.J., Arkin, A.P., and Onstott, T.C., 2008, Environmental genomics reveals a single-species ecosystem deep within earth: Science, v. 322, p. 275-278.

Crowe, S.A., Katsev, S., Leslie, K., Sturm, A., Magen, C., Nomosatryo, S., Pack, M.A., Kessler, J.D., Reeburgh, W.S., Roberts, J.A., Gonzalez, L., Haffner, G.D., Mucci, A., Sundby, B., and Fowle, D.A., 2011, The methane cycle in ferruginous Lake Matano: Geobiology, v. 9, p. 61-78.

Druschel, G.K., Emerson, D., Sutka, R., Suchecki, P., and Luther, G.W., 2008, Low-oxygen and chemical kinetic constraints on the geochemical niche of neutrophilic iron(II) oxidizing microorganisms: Geochimica Et Cosmochimica Acta, v. 72, p. 3358-3370.

Edwards, K.J., Rogers, D.R., Wirsen, C.O., and McCollom, T.M., 2003, Isolation and characterization of novel psychrophilic, neutrophilic, Fe-oxidizing, chemolithoautotrophic alpha- and, gamma-Proteobacteria from the deep sea: Applied and Environmental Microbiology, v. 69, p. 2906-2913.

Emerson, D., Fleming, E.J., and McBeth, J.M., 2010, Iron-Oxidizing Bacteria: An Environmental and Genomic Perspective, *in* Gottesman, S., and Harwood, C.S., eds., Annual Review of Microbiology, Vol 64, 2010, Volume 64: Annual Review of Microbiology: Palo Alto, Annual Reviews, p. 561-583.

Emerson, D., and Floyd, M.M., 2005, Enrichment and isolation of iron-oxidizing bacteria at neutral pH, Environmental Microbiology, Volume 397: Methods in Enzymology, p. 112-123.

Emerson, D., and Moyer, C., 1997, Isolation and characterization of novel iron-oxidizing bacteria that grow at circumneutral pH: Applied and Environmental Microbiology, v. 63, p. 4784-4792.

Frape, S.K., Blyth, A., Blomqvist, R., McNutt, R.H., and Gascoyne, M., 2004, Deep Fluids in the Continents: II. Crystalline Rocks, *in* Holland, H.D., and Turekian, K.K., eds., Treatise on Geochemistry, Volume 5: Amsterdam, Elsevier/Pergamon, p. 541-580.

Gauthier, M.J., Lafay, B., Christen, R., Fernandez, L., Acquaviva, M., Bonin, P., and Bertrand, J.C., 1992, Marinobacter-Hydrocarbonoclasticus gen-nov, sp-nov, a new, extremely halotolerant, hydrocarbon-degrading marine bacterium International Journal of Systematic Bacteriology, v. 42, p. 568-576.

Gihring, T.M., Moser, D.P., Lin, L.H., Davidson, M., Onstott, T.C., Morgan, L., Milleson, M., Kieft, T.L., Trimarco, E., Balkwill, D.L., and Dollhopf, M.E., 2006, The distribution of microbial taxa in the subsurface water of the Kalahari Shield, South Africa: Geomicrobiology Journal, v. 23, p. 415-430.

Huu, N.B., Denner, E.B.M., Ha, D.T.C., Wanner, G., and Stan-Lotter, H., 1999, Marinobacter aquaeolei sp. nov., a halophilic bacterium isolated from a Vietnamese oil-producing well: International Journal of Systematic Bacteriology, v. 49, p. 367-375.

Kelley, D.L., Kelley, K.D., Coker, W.B., Caughlin, B., and Doherty, M.E., 2006, Beyond the obvious limits of ore deposits: The use of mineralogical, geochemical, and biological features for the remote detection of mineralization: Economic Geology, v. 101, p. 729-752.

Kieft, T.L., McCuddy, S.M., Onstott, T.C., Davidson, M., Lin, L.H., Mislowack, B., Pratt, L., Boice, E., Lollar, B.S., Lippmann-Pipke, J., Pfiffner, S.M., Phelps, T.J., Gihring, T., Moser, D., and van Heerden, A., 2005, Geochemically generated, energy-rich substrates and indigenous microorganisms in deep, ancient groundwater: Geomicrobiology Journal, v. 22, p. 325-335.

Krumholz, L.R., 2000, Microbial communities in the deep subsurface: Hydrogeology Journal, v. 8, p. 4-10.

Lin, L.H., Wang, P.L., Rumble, D., Lippmann-Pipke, J., Boice, E., Pratt, L.M., Lollar, B.S., Brodie, E.L., Hazen, T.C., Andersen, G.L., DeSantis, T.Z., Moser, D.P., Kershaw, D., and Onstott, T.C., 2006, Long-term sustainability of a high-energy, low-diversity crustal biome: Science, v. 314, p. 479-482.

Lollar, B.S., Slater, G., Moser, D.P., Gihring, T.M., Telling, J., Lacrampe-Couloume, G., Lin, L.H., and Onstott, T.C., 2005, Abiogenic gases, H2 autotrophy and methanogenesis in the deep subsurface: Abstracts of Papers of the American Chemical Society, v. 229, p. 044-GEOC.

Lovely, D.R., Stolz, J.F., Nord, G.L., and Phillips, E.J.P., 1987, Anaerobic production of magnetite by a dissimilatory iron-reducing microorganism: Nature, v. 330, p. 252-254.

MacLean, L.C.W., Pray, T.J., Onstott, T.C., Brodie, E.L., Hazen, T.C., and Southam, G., 2007, Mineralogical, chemical and biological characterization of an anaerobic biofilm collected from a borehole in a deep gold mine in South Africa: Geomicrobiology Journal, v. 24, p. 491-504.

Moser, D.P., Gihring, T.M., Brockman, F.J., Fredrickson, J.K., Balkwill, D.L., Dollhopf, M.E., Lollar, B.S., Pratt, L.M., Boice, E., Southam, G., Wanger, G., Baker, B.J., Pfiffner, S.M., Lin, L.H., and Onstott, T.C., 2005, Desulfotomaculum and Methanobacterium spp. dominate a 4-to 5-kilometer-deep fault: Applied and Environmental Microbiology, v. 71, p. 8773-8783.

Moser, D.P., Onstott, T.C., Fredrickson, J.K., Brockman, F.J., Balkwill, D.L., Drake, G.R., Pfiffner, S.M., White, D.C., Takai, K., Pratt, L.M., Fong, J., Lollar, B.S., Slater, G., Phelps, T.J., Spoelstra, N., Deflaun, M., Southam, G., Welty, A.T., Baker, B.J., and Hoek, J., 2003, Temporal shifts in the geochemistry and microbial community structure of an ultradeep mine borehole following isolation: Geomicrobiology Journal, v. 20, p. 517-548.

Noble, R.R.P., Gray, D.J., and Reid, N., 2011, Regional exploration for channel and playa uranium deposits in Western Australia using groundwater: Applied Geochemistry, v. 26, p. 1956-1974.

Onstott, T.C., Moser, D.P., Pfiffner, S.M., Fredrickson, J.K., Brockman, F.J., Phelps, T.J., White, D.C., Peacock, A., Balkwill, D., Hoover, R., Krumholz, L.R., Borscik, M., Kieft, T.L., and Wilson, R., 2003, Indigenous and contaminant microbes in ultradeep mines: Environmental Microbiology, v. 5, p. 1168-1191.

Pedersen, K., Hallbeck, L., Arlinger, J., Erlandson, A.C., and Jahromi, N., 1997, Investigation of the potential for microbial contamination of deep granitic aquifers during drilling using 16S rRNA gene sequencing and culturing methods: Journal of Microbiological Methods, v. 30, p. 179-192.

Polito, P., Kyser, K., Lawie, D., Cook, S., and Oates, C., 2007, Application of sulphur isotopes to discriminate Cu-ZnVHMS mineralization from barren Fe sulphide mineralization in the greenschist to granulite facies Flin Flon-Snow Lake-Hargrave River region, Manitoba, Canada: Geochemistry-Exploration Environment Analysis, v. 7, p. 129-138.

Poulton, S.W., and Canfield, D.E., 2005, Development of a sequential extraction procedure for iron: implications for iron partitioning in continentally derived particulates: Chemical Geology, v. 214, p. 209-221.

Rastogi, G., Osman, S., Kukkadapu, R., Engelhard, M., Vaishampayan, P.A., Andersen, G.L., and Sani, R.K., 2010, Microbial and Mineralogical Characterizations of Soils Collected from the Deep Biosphere of the Former Homestake Gold Mine, South Dakota: Microbial Ecology, v. 60, p. 539-550.

Rogers, D.R., Santelli, C.M., and Edwards, K.J., 2003, Geomicrobiology of deep-sea deposits: estimating community diversity from low-temperature seafloor rocks and minerals: Geobiology, v. 1, p. 109-117.

Sahl, J.W., Schmidt, R.H., Swanner, E.D., Mandernack, K.W., Templeton, A.S., Kieft, T.L., Smith, R.L., Sanford, W.E., Callaghan, R.L., Mitton, J.B., and Spear, J.R., 2008, Subsurface microbial diversity in deep-granitic-fracture water in Colorado: Applied and Environmental Microbiology, v. 74, p. 143-152.

Sitte, J., Akob, D.M., Kaufmann, C., Finster, K., Banerjee, D., Burkhardt, E.M., Kostka, J.E., Scheinost, A.C.,Buchel, G., and Kuesel, K., 2010, Microbial links between sulfate reduction and metal retention in rranium- and heavy metal contaminated soil: Applied and Environmental Microbiology, v. 76, p. 3143-3152.

Sobolev, D., and Roden, E.E., 2001, Suboxic deposition of ferric iron by bacteria in opposing gradients of Fe(II) and oxygen at circumneutral pH: Applied and Environmental Microbiology, v. 67, p. 1328-1334.

Southam, G., and Saunders, J.A., 2005, The geomicrobiology of ore deposits: Economic Geology, v. 100, p. 1067-1084.

Stotler, R.L., Frape, S.K., Ruskeeniemi, T., Ahonen, L., Onstott, T.C., and Hobbs, M.Y., 2009, Hydrogeochemistry of groundwaters in and below the base of thick permafrost at Lupin, Nunavut, Canada: Journal of hydrology, v. 373, p. 80-95.

Stotler, R.L., Frape, S.K., Ruskeeniemi, T., Pitkanen, P., and Blowes, D.W., 2012, The interglacial-glacial cycle and geochemical evolution of Canadian and Fennoscandian Shield groundwaters: Geochimica et cosmochimica acta, v. 76, p. 45-67.

Straub, K.L., Benz, M., and Schink, B., 2001, Iron metabolism in anoxic environments at near neutral pH: Fems Microbiology Ecology, v. 34, p. 181-186.

Straub, K.L., Benz, M., Schink, B., and Widdel, F., 1996, Anaerobic, nitrate-dependent microbial oxidation of ferrous iron: Applied and Environmental Microbiology, v. 62, p. 1458-1460.

Sturm, A., Crowe, S.A., and Fowle, D.A., 2008, Trace lead impacts biomineralization pathways during bacterial iron reduction: Chemical Geology, v. 249, p. 282-293.

Swanner, E.D., Nell, R.M., and Templeton, A.S., 2011, Ralstonia species mediate Fe-oxidation in circumneutral, metal-rich subsurface fluids of Henderson mine, CO: Chemical Geology, v. 284, p. 339-350.

Viollier, E., Inglett, P.W., Hunter, K., Roychoudhury, A.N., and Van Cappellen, P., 2000, The ferrozine method revisited: Fe(II)/Fe(III) determination in natural waters: Applied Geochemistry, v. 15, p. 785-790.

# CHAPTER 3. BIOGEOCHEMICAL INDICATORS OF BURIED MINERALIZATION UNDER COVER, TALBOT PROSPECT, MANITOBA

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## ABSTRACT

A surficial geomicrobiological investigation was completed of glacial till overlying buried mineralization at the Talbot prospect, Manitoba, Canada, where previous surficial geochemistry surveys (van Geffen et al., 2012a; van Geffen et al., 2012b) indicated anomalous concentrations of elements above the buried mineralization. The Cu-Zn VMS deposit is overlain by 100m of Paleozoic dolomites and Quaternary glacial till. The geomicrobiological investigation demonstrates that there is distinct microbial ecology at the anomalous sampling locations, especially directly overlying buried mineralization. The combined geochemical and geomicrobiological analyses reveal the presence of an anomaly directly over mineralization due to oxidation of the buried ore. Specifically, geomicrobiological analyses yield an inverse correlation between Zn in the clay (<2μm size) fraction and total microbial biomass and a direct correlation between Cu in the clay (<2μm size) fraction and abundance of methanotrophic bacteria. These results demonstrate that microbiological analyses can be a useful addition to geochemical

exploration by revealing metal transport and sequestration processes and enhancing surficial anomalies.

## INTRODUCTION

The majority of ore deposits still undiscovered are obscured by burial, erosion, weathering, or structural offset (Cameron et al., 2004; Gilliss et al., 2004; Kelley et al., 2006). As mineral deposit discovery rates decline, increased attention is being focused on geochemical exploration methods for application in covered terrains (Townley, 2007). Some of the specific indicative signals (collectively referred to as a surface anomaly) include isotopic anomalies (Cameron et al., 2004; Kelley et al., 2006; Polito et al., 2007; Simonetti et al., 1996), accumulation zones of mobile indicator metals (Bajc, 1998; Gilliss et al., 2004), zones of low pH (Smee, 1998), high redox contrast (Hamilton et al., 2004a, b), and gas flux (Alpers et al., 1990; Fu et al., 2005; Gao et al., 2011; Lollar et al., 2006; Malmqvist et al., 1999). The most frequently used geochemical method to identify buried mineral deposits is the selective leaching of soil samples (Cameron et al., 2004). Models for the formation of these secondary features include electrochemical processes, expulsion of groundwater, dispersion of gas, glacial rebound, and biogeochemical processes (Cameron et al., 2004; Goodhue et al., 2005; Hamilton, 1998; Kelley et al., 2006; Mann et al., 2005), however; the specific mechanisms governing the formation of these secondary features remain debated (Hamilton et al., 2004a; Mann et al., 2005).

Biogeochemical processes in the subsurface may influence metal mobility and the generation of geochemical anomalies through a variety of indirect and direct means. Microorganisms have been documented to have a direct impact on ore bodies, including ore-forming, secondary metal enrichment, and weathering processes (Southam and Saunders, 2005). Microbial ore-forming processes and secondary enrichment have been implicated in many deposit types, including, uranium roll-front deposits (Mohagheghi et al., 1985), sedimentary iron deposits (Dexterdyer et al., 1984), native sulfur deposits (Southam and Saunders, 2005), supergene copper deposits (Enders et al., 2006; Nelson et al., 2009; Sillitoe et al., 1996), supergene zinc deposits (Bawden et al., 2003; Druschel et al., 2002; Labrenz et al., 2000), and placer gold deposits (Mossman et al., 1999; Reith et al., 2007). Enhanced metal release by the microbial oxidation in the subsurface has been documented for a variety of geochemical systems (Southam and Saunders, 2005). Oxidation of sulfide minerals and the subsequent release of metals (Cu, Zn, Au, Ag, Pb, etc) are increased by microbial metabolism of Fe- and S-oxidizers (Enders et al., 2006; Mielke et al., 2003; Sillitoe et al., 1996). Microorganisms are able to extract nutrients from solid phase, which results in the dissolution of the mineral structure (Rogers and Bennett, 2004; Rogers et al., 1998). Some of the elements required by microorganisms include ore metals, for example, Methanotrophs require Cu (Kulczycki et al., 2007) and Methanogens require Ni (Hausrath et al., 2007).

Biogeochemical processes that occur in the overburden overlying buried mineralization also influence metal mobility and the generation of geochemical anomalies. Microbial metabolisms may aid in the maintenance of the reduced column generated by electrochemical dispersion above a buried sulfide deposit (Southam and Saunders, 2005), which facilitates the transport of dissolved metal species to the surface (Goodhue et al., 2005).  Many of the isotopic signatures associated with mineral deposits may be due to microbial activity, as documented at copper-porphyry (Nelson et al., 2009), massive sulfide (Garuti et al., 2009), supergene sphalerite (Bawden et al., 2003; Garuti et al., 2009) and gold deposits (Rainbow et al., 2006).  Most microbial metabolisms generate gas as a byproduct and many organisms generate volatile metal complexes or organic metal-complexing compounds to detoxify their surroundings, all of which will increase metal mobility in the subsurface (Kelley et al., 2006; Southam and Saunders, 2005). The formation of secondary biogenic minerals, especially Fe (III)-minerals, have a high surface area and have tremendous ability to absorb trace metals (Southam and Saunders, 2005; Sturm et al., 2008).  Likewise, the cellular membranes of microbes themselves have been documented to have a high sorption capacity, and subsequently serve as nucleation sites for mineral precipitation (Ferris et al., 1987).

These processes suggest that a correlation between geochemistry and microbial ecology should exist, and in many conditions a direct link has indeed been found.  Concentrations of Au and *Bacillus cereus* spore forming cultures were found to correlate in soils above buried mineralization at several locations (Melchior et al., 1996; Parduhn, 1991; Reith et al., 2005).  Organisms that have been implicated in sulfide weathering (Fe- and S-oxidizing bacteria) and supergene enrichment (sulfate reducing bacteria) have been found in higher abundance directly above buried mineralization (Enders et al., 2006; Goodhue et al., 2005).  While some associations are known to be strong such as the use of Cu by methanotrophs and Ni by methanogens, definite field correlations are lacking (Knapp et al., 2007).  It has also been documented that in situations where specific species could not be identified for use a pathfinder to mineralization, the microbial community directly above mineralization was significantly different than background locations (Reith and Rogers, 2008; Wakelin et al., 2012).

The purpose of the present research is to investigate the geomicrobiology of geochemical surficial soil anomalies in a glaciated terrain above a VMS deposit at the Talbot prospect in the Flin Flon-Snow Lake area, Manitoba, Canada (Figure 1). The elemental chemistry of the soil, trees, and litter was previously investigated, and the geochemical anomaly delineated (van Geffen, 2011; van Geffen et al., 2012b). The geomicrobiological survey integrated these data and determined the abundance of microorganisms and the microbial community structure by phospholipid fatty acid analysis over the Talbot prospecting grid.

## GEOLOGIC SETTING

The Talbot prospect consists of Cu-Zn volcanogenic massive sulfide mineralization (VMS) in Paleoproterozoic crystalline basement rocks unconformably overlain by approximately 100 m of dolomite and up to 2 m of glacial till (van Geffen et al., 2012b). Drilling of a geophysical anomaly discovered the mineralization, however no other mining activities have occurred in the area. A central depression runs parallel to the geophysical anomaly, and sub-cropping dolomite in the western part of the prospect forms a slight topographic high (Figure 2). Standing water occupies low-lying areas for most of the year, creating small bogs with aspen vegetation.

There are two ore smelters within a 200 km radius (Flin Flon Cu-Zn smelter at 160 km NW and the Thompson Ni smelter at 210 km NNE), which may affect trace metal composition, and the mineralogical composition of the glacial till is extremely variable over the area. The vegetation is also extremely variable, partly due to differences in mineralogy, but also because of logging activities, vertical relief and fires. A more detailed overview of the geologic setting of the Talbot prospect is available (van Geffen et al., 2012a; van Geffen et al., 2012b).

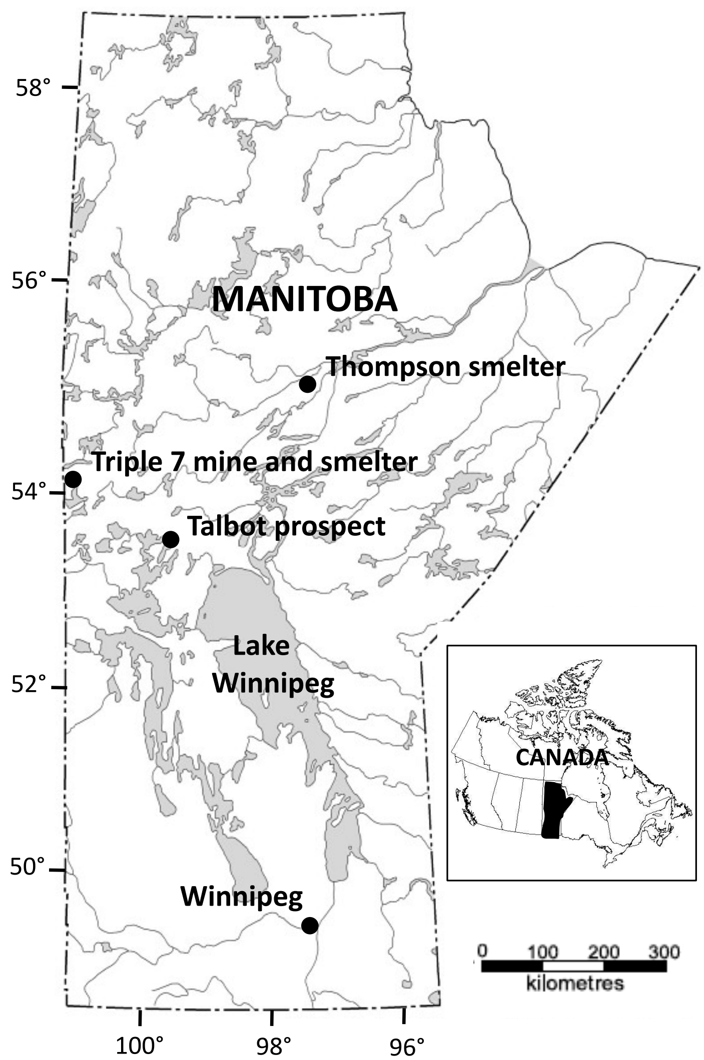


Figure 1: Location map of the Talbot prospect, Manitoba, Canada.

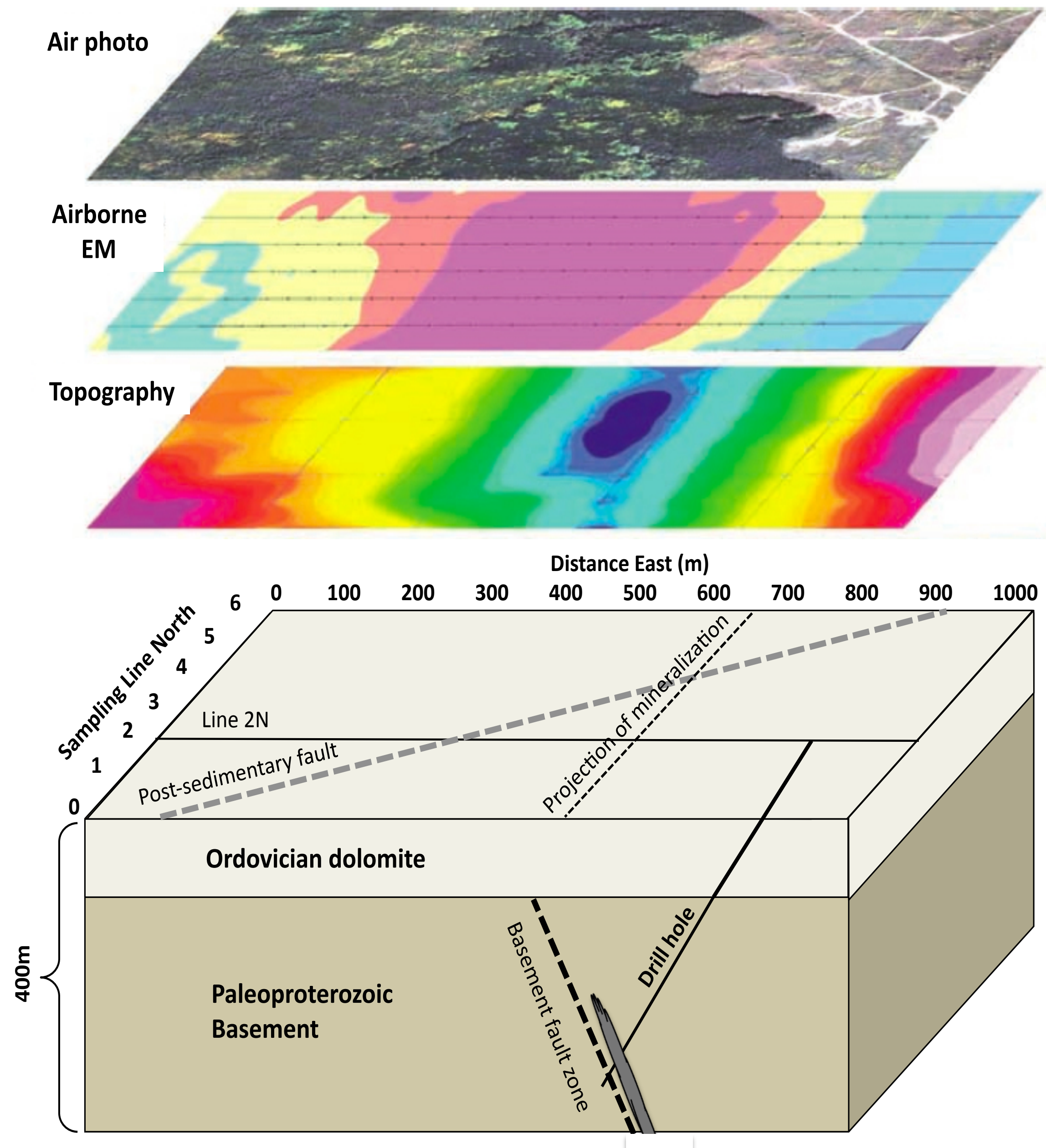


Figure 2: Block diagram of the Talbot prospect. Location of mineralization at depth, post-sedimentary fault at surface, projection of mineralization at surface and sampling Line2N are indicated. Figure modified from Van Geffen et al., 2012.

## METHODS

### *Sampling and Analyses for the Geochemical Soil Survey*

Researchers at Queen's University completed a geochemical sampling survey over the Talbot exploration grid in June 2006 and 2007 (van Geffen et al., 2012a; van Geffen et al., 2012b). Till samples were collected from 151 sites over the 1000 x 600m Talbot exploration area, at depths of 5 to 20cm below the organic horizon. Sample spacing varied from 25m intervals near to the projected mineralization to 50 and 100m spacing further away. To examine the metal association with mineralogical phases, separate samples were collected along Line2N from 15 sites for selective extractions. To assess the vertical distribution of elements in the till cover, depth profiles were sampled at 15 sites along Line 2N of the Talbot exploration grid. At each site, five brick-shaped, 20 x 20cm samples of 10cm depth intervals were collected to a depth of 50cm. Where sub-cropping dolomite was present, between 100E and 300E, till profiles had maximum depths of 20 and 30cm. Prior to sampling the area at each site was cleared of moss, litter, and roots, and the till was homogenized in the sample pit.

All till samples were processed at ACME Laboratories in Vancouver, British Columbia. A split of the till was dried and sieved to <250μm before analysis, and another split was used for clay-fraction separation (<2μm). ACME Laboratories analyzed the samples using a modified aqua-regia digestion followed by ICP-MS and ICP-OES measurement of 53 elements. Samples were sent to Geological Survey of Canada (GSC), SGS, and Actlabs laboratories, for commercially available selective extractions. All GSC extraction methods (deionised water, ammonium acetate at pH

7, ammonium acetate at pH 5, sodium pyrophosphate, hydroxylamine-hydrochloride and 1% nitric acid) used till splits of 1g suspended in 50ml leach solution in centrifuge tubes that were agitated on a shaker table for 2 hrs. After centrifuging, the supernatant was decanted and acidified to 1% HNO3, before ICP-MS and ICP-OES analysis. Bioleach by Actlabs and Mobile Metal Ion (MMI) by SGS Laboratories are proprietary techniques that are commercially available.

The till and its clay extracts from depth-profiles were analyzed for carbon isotopes at Queen's Facility for Isotope Research, Queen's University, Canada. Total carbon was extracted using combustion in oxygen at ~1700°C with an elemental analyzer on-line with a MAT 252 isotope ratio mass spectrometer (IRMS). Carbon isotopic compositions of the dolomites were measured with a GasBench on-line with a Delta Plus XP IRMS. Carbon isotope-ratios are expressed as $\delta^{13}C$ relative to the Pee Dee belemnite (PDB) standard:

$$\delta^{13}C = [(^{13}C/^{12}C)_{sample} / (^{13}C/^{12}C)_{standard} - 1] * 1000 \text{ (in ‰)}$$

Soil organic matter (SOM) was determined for samples that were collected along Line2N in 2007 by ACME laboratories. Soil samples collected for biological analyses were also analyzed for SOM (analyses completed by the University of Kansas). Both sets of analyses were completed using loss on ignition (LOI), where dried soil samples are heated at 550°C for 4 hrs (Heiri et al., 2001).

*Biological Analyses*

Till cores were collected for biological sampling in September 2008, using a Dutch type Clay Auger. Samples were collected at 33 different sites on the 1000 x 600m Talbot exploration grid. The most eastern 200m of the Talbot Grid was not sampled, as recent logging activities clear-cut the area. At each site, moss, litter and roots were cleared and the auger was sterilized with ethanol prior to sampling. Cores were taken in duplicate at each site to a depth of 45cm. Samples were freeze-dried and homogenized over 15cm depth intervals and stored at -80°C.

Total Biomass and Phospholipid Fatty Acid (PLFA) analyses were completed on all samples in duplicate. Total biomass and PLFA analyses were completed following previously described procedures (Rajendran et al., 1997). Briefly, 5-10g of soil was weighed and lipids were extracted with a single-phase chloroform-methanol-buffer (1:2:1 v/v/v) (White et al., 1979). The extraction mixture was stored at 4°C in the dark for 24hr, and the lipid-containing layer was separated by the addition of chloroform and water (Findlay et al., 1989). The bottom lipid containing phase was filtered and recovered (Findlay et al., 1989). For PLFA analysis, polar lipids were separated from neutral lipids and glycolipids using silicic column chromatography (Macalady et al., 2000). The polar lipids were subjected to mild alkaline methanolysis (White et al., 1979) and the resulting Fatty Acid Methyl Esters (FAMEs) were purified by column chromatography (Macalady et al., 2000; Rajendran et al., 1997). The purified FAMEs were dissolved in hexane containing an internal standard (20:0 ethyl ester) and analyzed on a gas chromatograph ((Agilent Technologies Network GC System 6890N) equipped with a DB-5 (cross-linked 5%

methylphenyl silicone) capillary column and flame ionization detector (FID). The individual PLFAs were identified using 36 bacterial FAME standards (Macalady et al., 2000). Total viable biomass was determined subsequent to the extraction procedure following previously documented procedures (Findlay et al., 1989). Phosphate was liberated by potassium persulfate digestion in sealed ampoules at 95°C overnight. Phosphate concentrations were determined spectrophotometrically after the addition of ammonium molybdate and malachite green.

PLFAs are described using the nomenclature following the pattern of A:BωC. The "A" describes the number of carbons, "B" the number of unsaturations, followed by the double bond locations referenced from the aliphatic (w) end of the molecule (Macalady et al., 2000). Other nomenclature includes a "c" for *cis* or a "t" for *trans* configuration, mid-chain branching is denoted by "me" and cyclopropyl fatty acids are designated as "cy" (Macalady et al., 2000).

## RESULTS

### *Geochemistry*

The samples collected along Talbot Line 2N were divided into anomalous (between 400E and 650E) and background samples based on a deep-trending structure at 400E, an airborne EM anomaly between 400E and 600E, and the vertical projection of intersected mineralization at about 400m depth at 650E. Various selective extractions (listed in Figure 3) were used to analyze the till samples collected along Talbot line 2N, and the elemental concentrations resulting from the selective extractions were interpreted using the Student's t-test by Van Geffen et al., 2012. Van Geffen et al., 2012 found that Zn concentrations demonstrate the greatest contrast (anomalous > background) in most extractions, implying that Zn as an indicator element forms the strongest anomalies.

The Zn concentrations in the selective extractions (Figure 3(a)-(e)) are plotted in order of increasing strength of extraction. Target phases of the selective extractions are listed in Figure 3(f), and bold indicates calculated *t* Probability % of <5% for Zn concentration in the specific selective extraction. All extraction methods except Bioleach result in elevated Zn concentrations at 400m easting (400E) along the Talbot Line 2N profile. At 650E only the clay-fraction aqua regia and sodium pyrophosphate extractions produce elevated Zn concentrations. Based on these results, Van Geffen et al., 2012 concluded that the deep-trended fault at 400E controls the till geochemistry and anomaly development at surface along Talbot Line 2N. As aqua regia applied to the clay (<2μm size) fraction and weaker leaches (Enzyme Leach, deionised water, sodium pyrophosphate, and ammonium acetate pH 7) applied to till (<250μm size) fraction tend to produce greater contrast anomalies than more acidic extractions (1% nitric acid, hydroxylamine-HCl, and aqua regia), Van Geffen et al., 2012 concluded that the observed Zn anomalies are related to weakly bound, labile species in the till profile, most probably bound to compounds in the clay fraction.

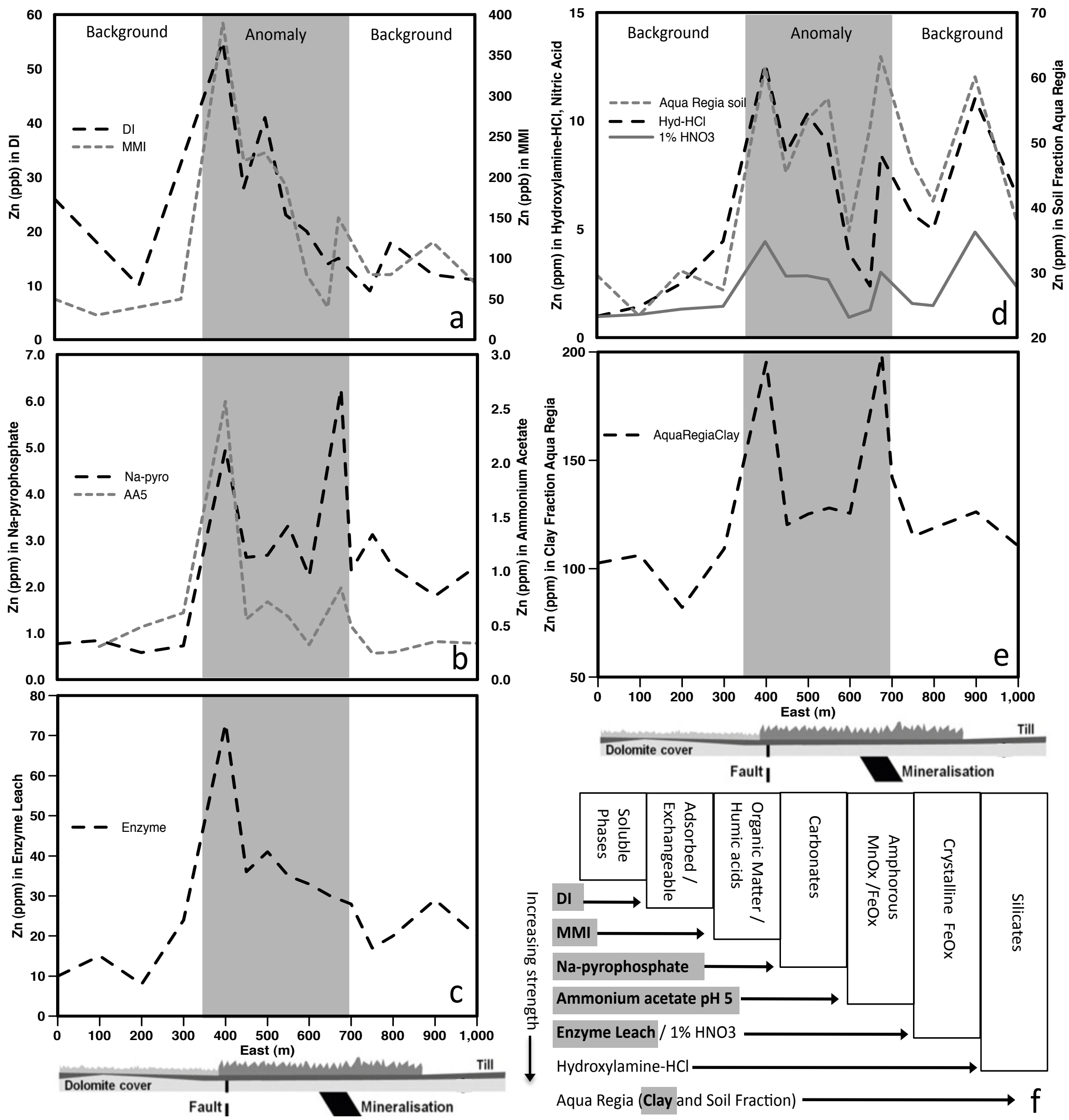


Figure 3: (a)-(e) Zn concentration in till along Talbot Line 2N by 11 partial extractions in order of increasing strength of extraction (Ammonium acetate pH 7 and bioleach data not shown) (f) Target phases of partial extractions, bold indicates positive (anomaly > background) contrast in Zn, as determined by *t*-Probabilities. The expected anomalous area is shaded and the location of the fault and the projection of mineralization to the surface are indicated. Data from Van Geffen, 2011.

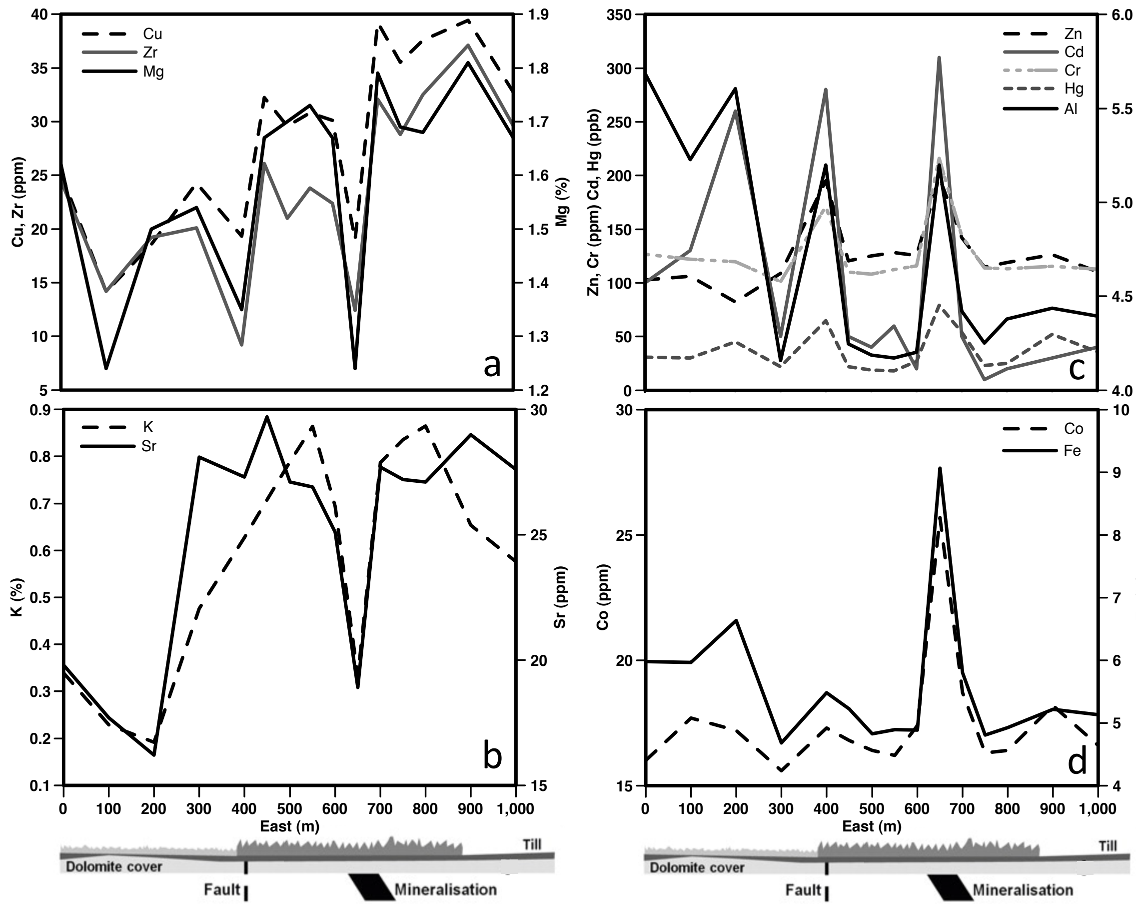


Figure 4: Elements in clay-size (<2μm) fraction aqua regia extraction (a) double negative anomaly (Na and Ti not shown) (b) single negative anomaly (c) double positive anomaly (Ni, P, Pb, and U not shown) (d) single positive anomaly (Mo and V not shown). Data from Van Geffen et al., 2012.

Elemental concentrations for other indicator and major elements in the clay (<2μm size) fraction aqua regia extraction are plotted in Figure 4. The indicator elements Cu, Ti, Zr, and major elements Mg, Na produces negative anomalies at 400E and 650E (Figure 4(a)). Major elements K and Sr show a negative anomaly only at 650E (Figure 4(b)). Many elements create positive anomalies at 400E and 650E, similar to Zn (Figure 4(c)), specifically: Al, Cd, Cr, Hg, Ni, P, Pb, and U. A few redox-sensitive elements (Fe, Co, Mo, V) produce a positive anomaly only at 650E.

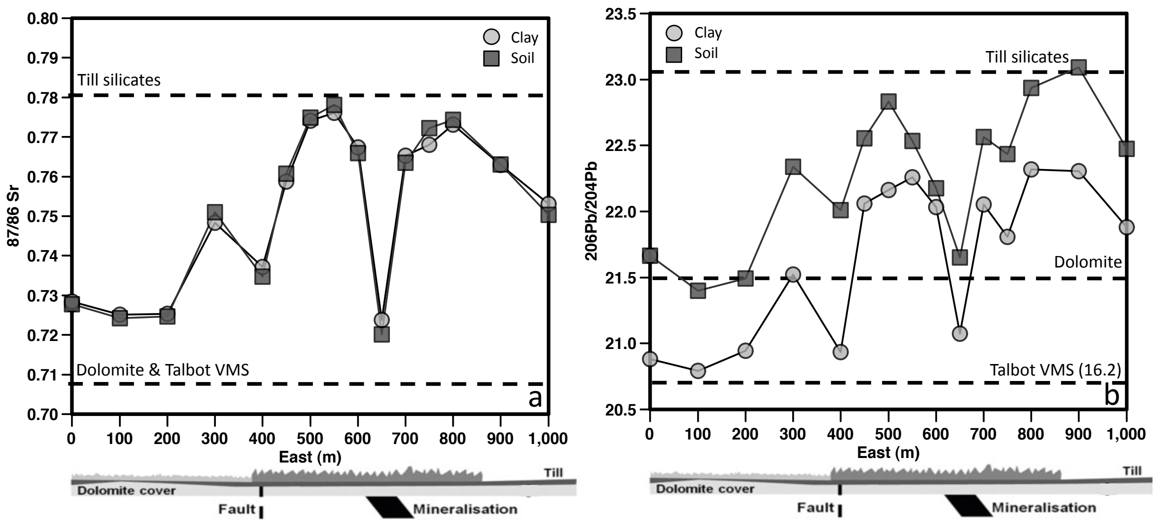


Figure 5: (a) Strontium isotope-ratios along Talbot 2N in clay (<2um) and till (<250um) size fractions. (b) Lead isotope-ratios along Talbot 2N in clay (<2um) and soil (<250um) size fractions. 'Till silicates' refers to the most radiogenic ratios of all clay samples in the study, 'dolomite' refers to the composition of the upper dolomite sequence and 'VMS' represents the composition of sulfide mineralization. The isotopic composition of the main relevant sources of Pb and Sr are represented as dashed lines. Location of the fault and projection to mineralization are indicated. Data from Van Geffen, 2011.

Van Geffen et al. (2012) also measured Sr and Pb isotopic compositions along Talbot Line2N (Figure 5). The $^{87/86}$Sr ratios of the <250μm and <2μm size fractions vary from 0.7201-0.7781, and the $^{87/86}$Sr ratio of Sr sources are 0.7105 (sulfides), 0.7376-0.8728 (host rock), and 0.7085-0.7088 (dolomites) (Figure 5(a)). The $^{206}$Pb/$^{204}$Pb ratios of the <250μm and <2μm size fractions vary from 20.793-22.318 and 20.315-23.093, respectively. The $^{206}$Pb/$^{204}$Pb ratios of the Pb sources are 16.196 (sulfides) and 21.614-27.917 (dolomites) (Figure 5(b)). The Pb and Sr isotope-ratios of the till are similar to the underlying dolomite in the western 200m, where the till cover is thin and small dolomite outcrops are present. Further east, the till is dominated by silicate components with relatively more-radiogenic Pb and Sr. Less radiogenic Pb and Sr occur at the fault zone (400E) and at the vertical projection of mineralization (650E). Van Geffen et al. (2012) attributed the presence of the less-radiogenic Pb and Sr at 400E and 650E to enhanced transport of Pb from buried mineralization and Sr from the underlying dolomite. They explain this by the presence of the fault at 400E, although major structures are not evident at 650E.

*Microbial Biogeochemistry*

Nutrient concentrations, pH, total viable biomass (cell counts), and microbial community composition were determined on selected sampling sites over the Talbot Grid. Soil pH in the carbonate-rich area of Talbot Line2N ranges from 6.5-8 whereas in the clay-rich area of Line 2N, soil pH is below 6.5 at all locations except at the projection to mineralization (650E) (Figure 6(a)). Soil organic matter ranges from 4-10%, with the lowest values occuring at the fault (400E) and projection to mineralization (650E) (Figure 6(b)). Phospholipid fatty acids (PLFA) are found in the cellular membranes of all living cells, and quantitative analysis provides a means to measure viable microbial biomass, community composition, and nutritional status (White et al., 1998). Total viable biomass ranges from 0.2-0.4ρmol of lipid per gram of soil along Line 2N, with the lowest values occurring at the fault (400E) and projection to mineralization (650E).

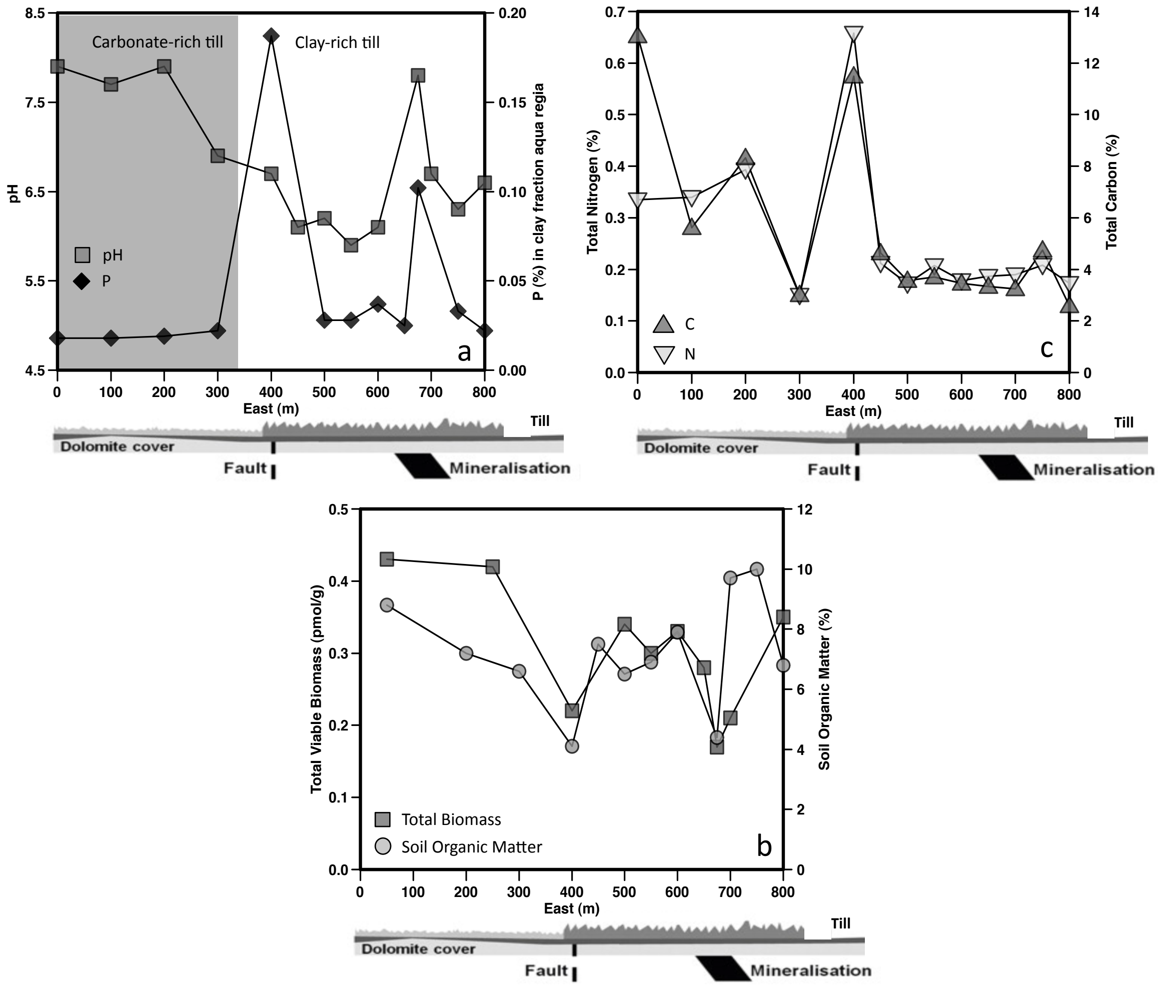


Figure 6: (a) Variation in soil pH and phosphorus content (clay (<2μm size) fraction aqua regia) along Talbot Line2N. Differences in soil mineralogy and texture are indicated. (b) Soil organic matter content and total viable biomass along Talbot Line 2N. The location of the fault and projection to mineralization are indicated. (c) Total carbon and total nitrogen along Talbot Line 2N. The location of the fault is indicated.

Total carbon content ranges from 2-14%, with the highest values occurring at 0E, 200E and 400E (Figure 6(c)). Total nitrogen content ranges from 0.1-0.7%, with the highest value occurring at 400E. Figure 7(a)-(b) show the Peasrson correlation of total viable biomass with soil organic matter ($r = 0.68$, $p < 0.001$) and phosphorous with soil organic carbon ($r = -0.47$, $p = 0.003$) over the Talbot grid. Figure 7(c) illustrates the correlation of carbon with nitrogen ($r = 0.82$, $p < 0.001$) and carbon with phosphorus ($r = 0.71$, $p = 0.004$) over Talbot Line 2N.

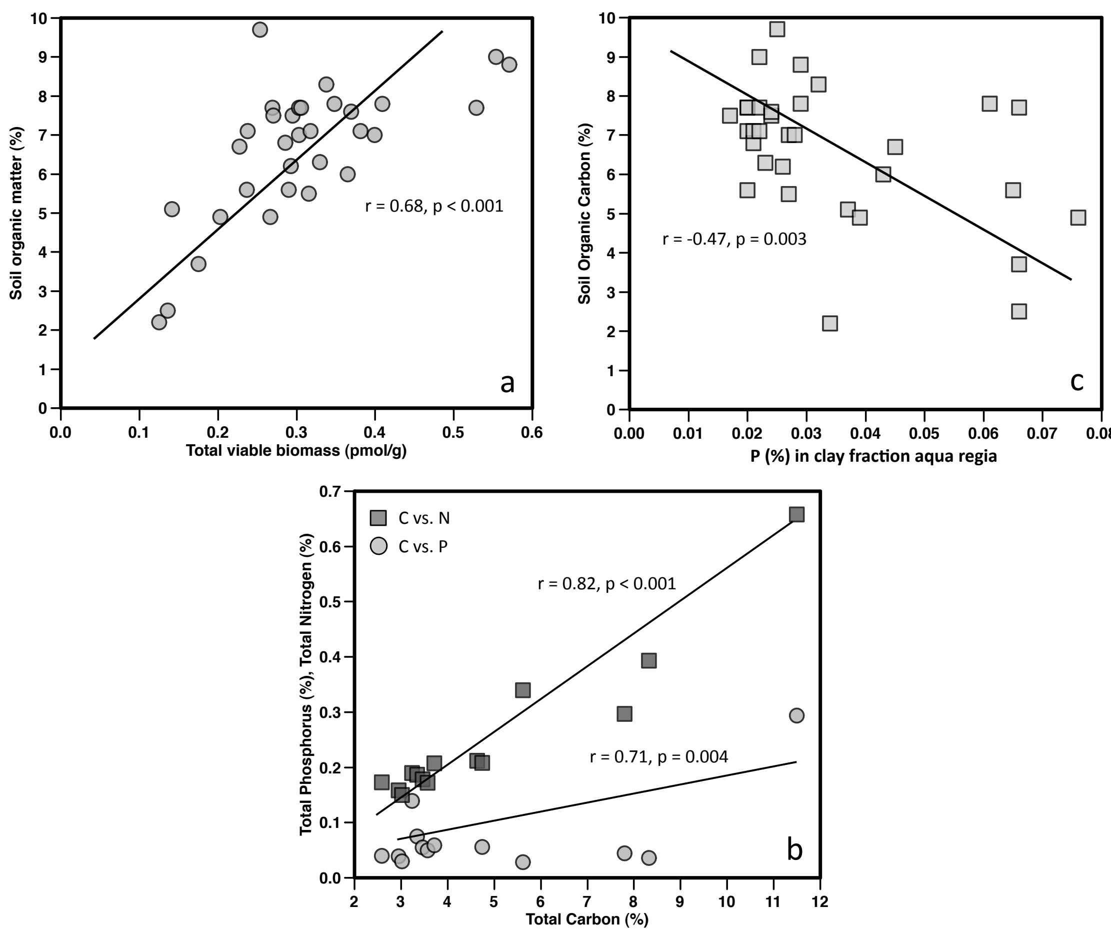


Figure 7: Pearson correlation plots of (a) total viable biomass and soil organic matter (b) phosphorus in clay (<2μm size) fraction aqua regia and soil organic matter (c) total carbon, total nitrogen, and total phosphorus.

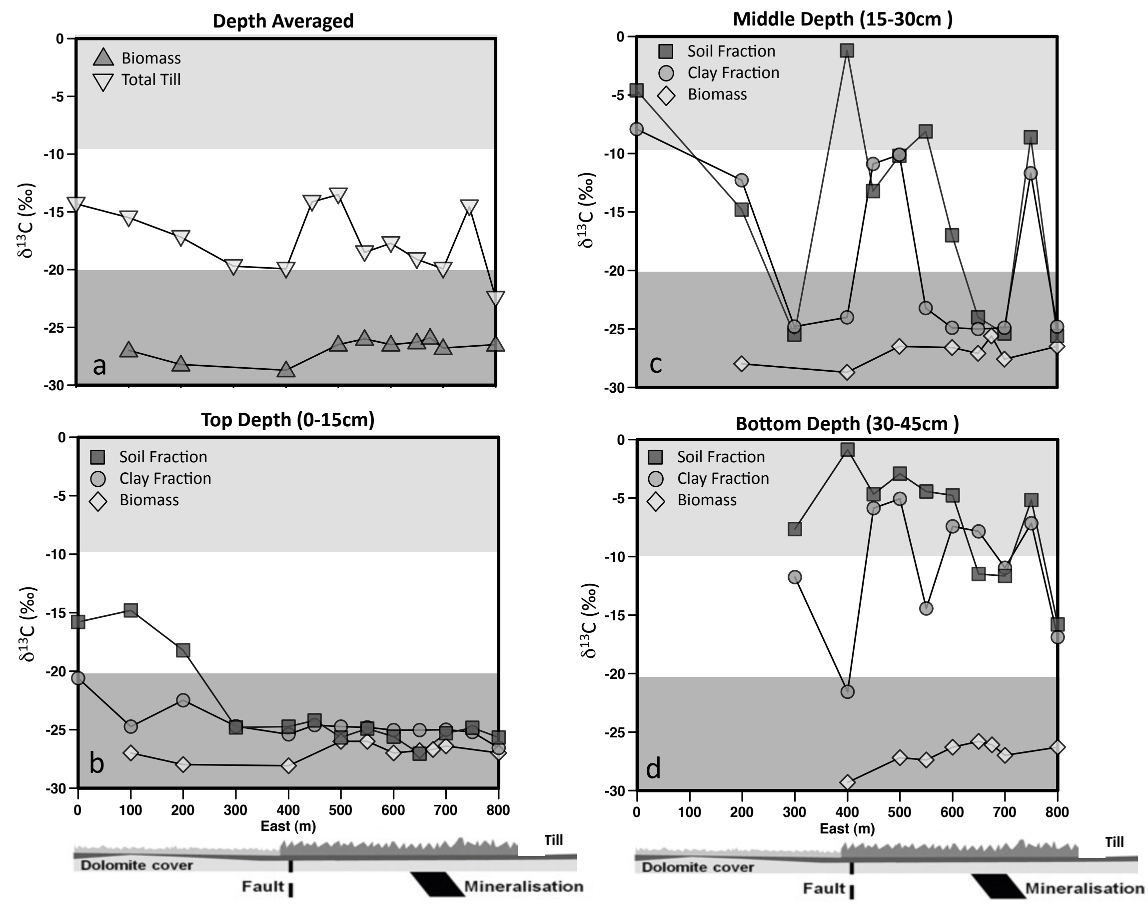


Figure 8: (a) Isotopic composition ($\delta^{13}C$) of the total till and total lipid biomass along Talbot Line 2N. (b)-(d) Isotopic composition ($\delta^{13}C$) of the lipid biomass, clay (<2μm size) fraction and till (<250μm size) fraction over the Talbot Line 2N depth profile. The local carbon sources, dolomite and soil organic matter, have an isotopic composition of ~2‰ and ~ -26‰, respectively, and are represented by shaded areas. Location of the fault and projection to mineralization are indicated by dashed line. Clay and till isotopic data from Van Geffen, 2011.

Carbon isotope-ratios of the till and clay fractions (determined by Van Geffen et al., 2012) and carbon isotope-ratios of the biomass along the depth profile of Line 2N are shown in Figure 8. The dolomite underlying the Talbot till has a $\delta^{13}C$ that ranges from - 0.6 to +2.0‰ and a typical $\delta^{13}C$ of soil organic matter is - 26‰. In both size fractions the $\delta^{13}C$ values at the top of the depth profile are consistent with organic sources (-30 to -20‰), with the highest values occurring at the carbonate-rich area of Line 2N (Figure 8(b)). The $\delta^{13}C$ values at the base of the profile (– 8 to 0 ‰) reflect the underlying dolomites, with lows occurring at 400E, 550E, and 800E in the clay-size fraction and 650E, 700E, and 800E in the soil-size fraction (Figure 8(d)). The isotopic composition of both size fractions in the middle depth demonstrate the largest range (– 25 to 0‰), with the lowest values occurring at 300E, 400E, 500-700E, and 800E in the clay-size fraction and at 300E, 650E, and 700E in the soil-size fraction (Figure 8(c)). The $\delta^{13}C$ of the depth averaged total till (-12 to -22‰) and depth averaged total biomass (-25 to -30 ‰) along Line 2N is presented in Figure 8(a). Isotopic lows occur at 300-400E, 550E-700E, and 800E. The $\delta^{13}C$ of the biomass, both depth-averaged and at all depths, does not demonstrate much variation, except for a slight high at 650-700E.

Microbial community structure was determined by relative percentages of the five PLFA structural types (normal saturates, terminally and mid-chain branched saturates, monoenoics, polyenoics and branched monounsaturates). Although there is considerable overlap, these structural types can be used to identify certain guilds of microorganisms: branched saturates are indicative of Gram-positive bacteria, but also sulfate reducing bacteria and actinomycetes; monoenoics of Gram-negative bacteria; polyenoics of micro-eukaryotes (e.g., fungi); and branched monounsaturates of obligate anaerobes (e.g., sulfate-reducing bacteria and iron-reducing bacteria) (Green and Scow, 2000; Ludvigsen et al., 1999; White et al., 1998).

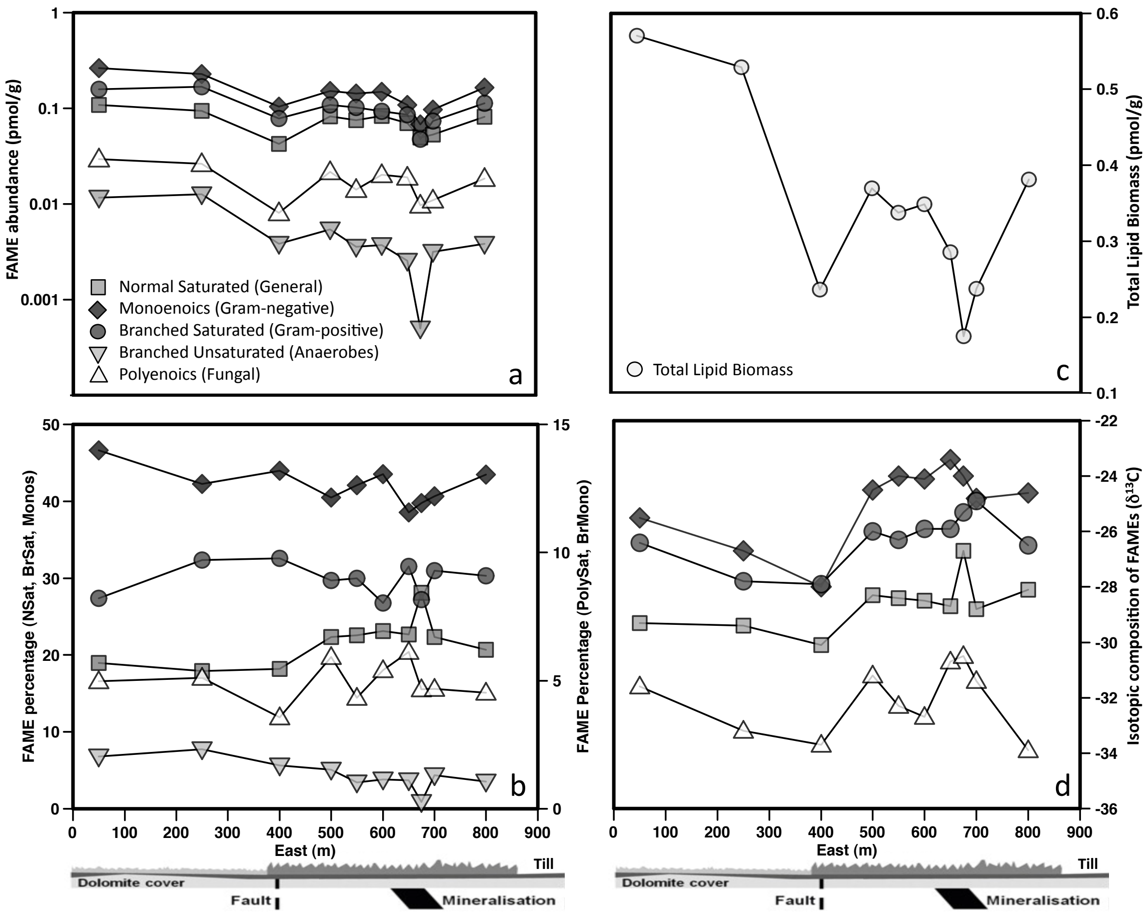


Figure 9: Microbial community composition as determined by phospholipid fatty acid (PLFA) analysis, represented as absolute concentration of PLFAs (a) and percentage of total PLFA (b). Normal saturated (Nsats) fatty acids indicate general microbial and plant abundance, branched saturated (BrSats) fatty acids are indicative of gram-positive bacteria, monounsaturated (Monos) fatty acids signify gram-negative bacteria, and polyunsaturated (Poly) fatty acids indicate fungi. Total microbial abundance is represented as total lipid biomass along Line 2N (c). (d) Average isotopic composition ($\delta^{13}C$) of the general microbial guilds, as determined by compound specific isotopic composition.

Microbial community composition along Talbot Line2N is displayed as absolute concentration (Figure 9(a)), and relative percentage (Figure 9(b)).

Comparing the microbial community composition in μg PLFA/g soil (Figure 9(a)) to the total viable biomass (Figure 9(c)), the same trends are apparent, with the highest concentrations occurring in the new growth/shallow depth area (0E-300E), lower concentrations throughout the old growth area (400E-800E), and extreme lows occurring at the fault (400E) and projected intersection of buried mineralization (650E). Relative abundance of the structural groups does not show the same trend as the absolute abundance, the extreme lows at 400E and 650E do not appear in a single PLFA structural group. The monoenoics (Gram negative bacteria) are the most abundant microbial guild, with values ranging from 40-50%. Branched saturates (Gram positive) follow a similar trend, with the lowest concentration occurring at 650E. Normal saturates show the largest variance, (20-40%) with the highest occurrence at 650E. Polyenoic (Fungi) abundance along Line2N ranges from 3-6% (data not shown).

The isotopic composition of the individual PLFAs was determined by compound-specific isotope analysis (CSIA), and the average composition for the structural groups is shown in Figure 9 (d). The values range from -22 to -34‰, with the polyenoic group being the lowest in value. All groups show an isotopic depletion at 400E, and enrichment at 650-700E. The polyenoic group also has an isotopic high at 550E, and the branched saturated also has a high at 800E. The branched unsaturated structural group was below detection.

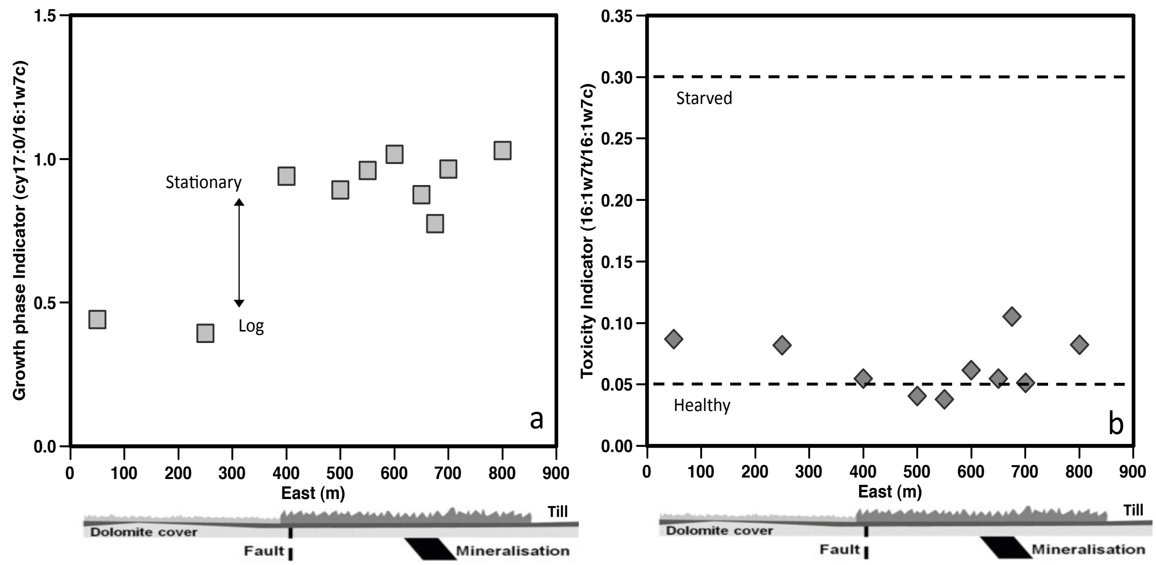


Figure 10: (a) Indicator of microbial growth phase (cy17:0/16:1ω7c ratio) in Gram-negative bacteria. As microbes slow in growth, and move from log to stationary growth phase the ratio increases. (b) Indicator of microbial toxicity/starvation (16:1ω7t/16:1ω7c ratio). A typical healthy microbial population has a value of 0.1, with a general range of 0.05 (healthy) to 0.3 (starved).

In Gram-negative bacteria the ratio of cyclopropyl fatty acids to their monoenoic precursors reflects the physiological status of the population (Guckert et al., 1986; Ludvigsen et al., 1999). The ratio increases as populations move from a logarithmic (0.5) to stationary (2.5) growth phase. Along Talbot Line2N the two locations in the new growth area (50E and 250E) have a cy17:0/16:1ω7c ratio of ~0.5, while the remaining locations in the old growth area have cy17:0/16:1ω7c ratios of ~1.0 (Figure 10(a)). Gram-negative bacteria also adjust the ratio of *trans/cis* monoenoics in response to environmental stresses, such as toxicity or starvation (Guckert et al., 1986; Ludvigsen et al., 1999). The *trans/cis* ratio usually ranges from 0.05 (healthy population) to 0.3 (starved). The 16:1ω7t/16:1ω7c ratio of the sample locations ranges from 0.04 to 0.13 (Figure 10(b)).

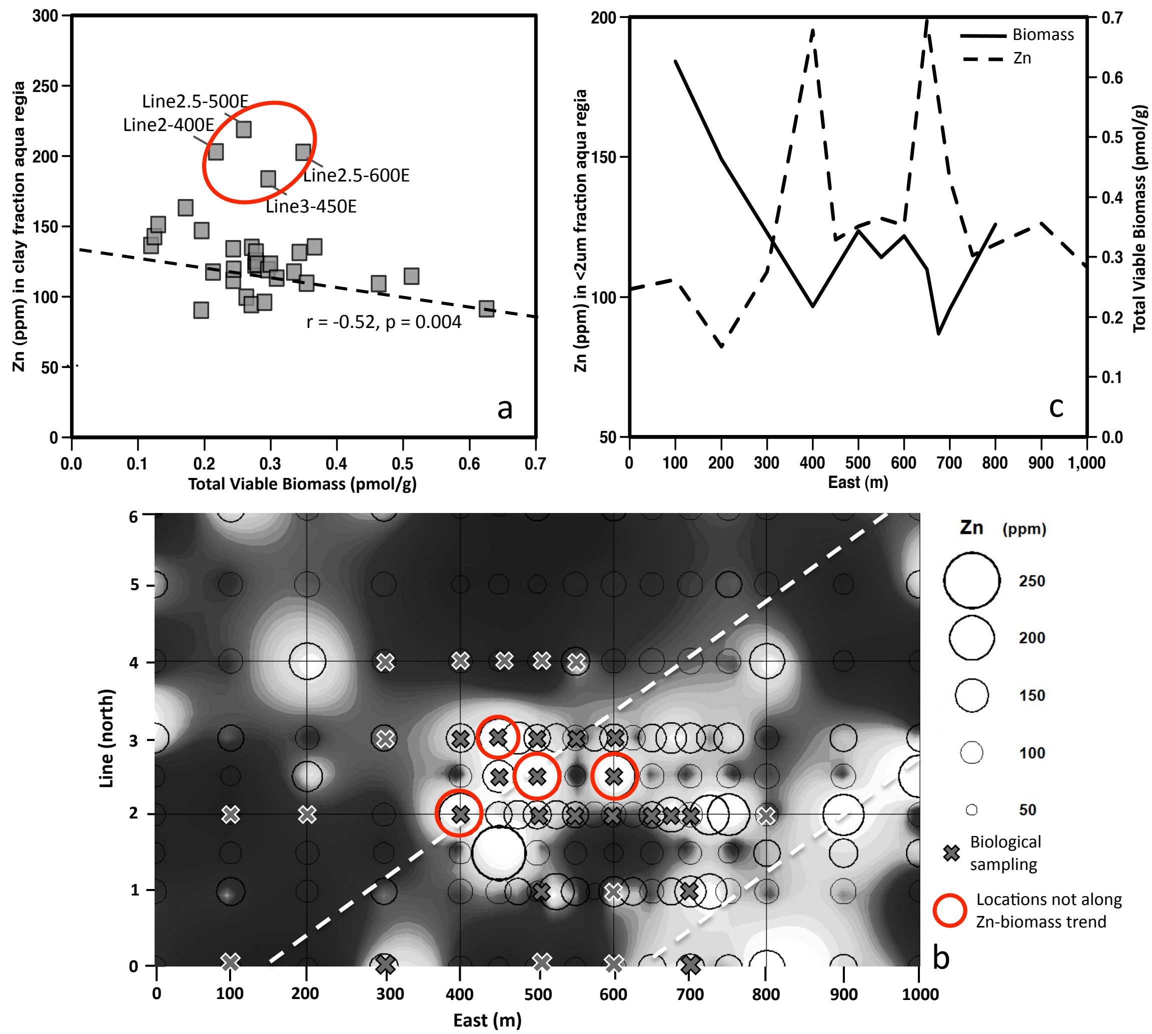


Figure 11: (a) Relationship between total viable biomass and Zn concentration in the clay fraction aqua regia over the Talbot sampling grid. Sample locations that do not follow the trend are labeled and indicated by the circle. (b) Zinc concentration in the clay fraction aqua regia over the Talbot grid. Locations sampled for phospholipid biomass are marked with an “x”. Faults are indicated by dashed lines, and locations that do not follow the Zn-Biomass trend are in red. (c) Total viable biomass and Zn concentration in clay fraction aqua regia along Talbot Line 2N.

Total viable biomass (estimated from total phospholipid fatty acid and measured using microbial phosphate determination) demonstrates a negative correlation ($r = -0.52$, $p = 0.004$) with Zn concentration in the clay (<0.2μm size) fraction aqua regia extraction over the Talbot sampling grid (Figure 11(a)). Samples with anomalous Zn concentration plot above the negative Zn-biomass correlation (Figure 11(a)). Those locations include Line2N-400E, -675E, Line2.5N-500E, -600E, and Line3N-450E. The Talbot sampling grid (Figure 11(b)) records the Zn concentration at all sampling locations (open circles, circumferences indicates concentration) and sampling locations for microbial analyses (solid x-marks). Zn concentration and total viable biomass along Line2N only is illustrated in Figure 11(c). The negative Zn-biomass trend is especially obvious at 400E and 675E, where biomass is lowest and Zn is highest (Figure 11(c)).

In some cases, the association of a specific PLFA is so strong that individual microbial guilds can be identified by their presence (Green and Scow, 2000), and these compounds are referred to as signature lipid biomarkers (SLBs). Sulfate reducing bacteria have been identified by the presence of the following PLFA: 15:1, 16:1ω5, 16:1ω7, 17:1ω6, i17:0, i15:1ω7c, i17:1ω7c, i19:1ω7c and 10me16:0 (Arning et al., 2008; Green and Scow, 2000; Ludvigsen et al., 1999; Macalady et al., 2000). Type I Methanotrophs have been identified by 16:1ω8c and 16:1ω6c and Type II by 18:1ω8c, 18:1ω8t, and 18:1ω6c (Ding and Valentine, 2008; Watzinger et al., 2008). While the monoenoic 16:1ω7c is commonly found in Gram-negative bacteria, and 10me16:0 has been found to be associated with SRB, both biomarkers have been found in the membranes of Fe-reducers, specifically *Geobacter* and *Shewenella* (Ludvigsen et al., 1999). It has been previously documented that methanotrophs need Cu for metabolic enzymes (Knapp et al., 2007), and the organisms actively mobilize it for their use (Kulczycki et al., 2007). The abundance of both Type I and II Methanotrophs follows the same trend as Cu concentration in the clay (<2μm size) fraction aqua regia along Talbot Line 2N (Fig. 12(a)-(b)), having a significant Pearson correlation (r = 0.56, p = 0.002).

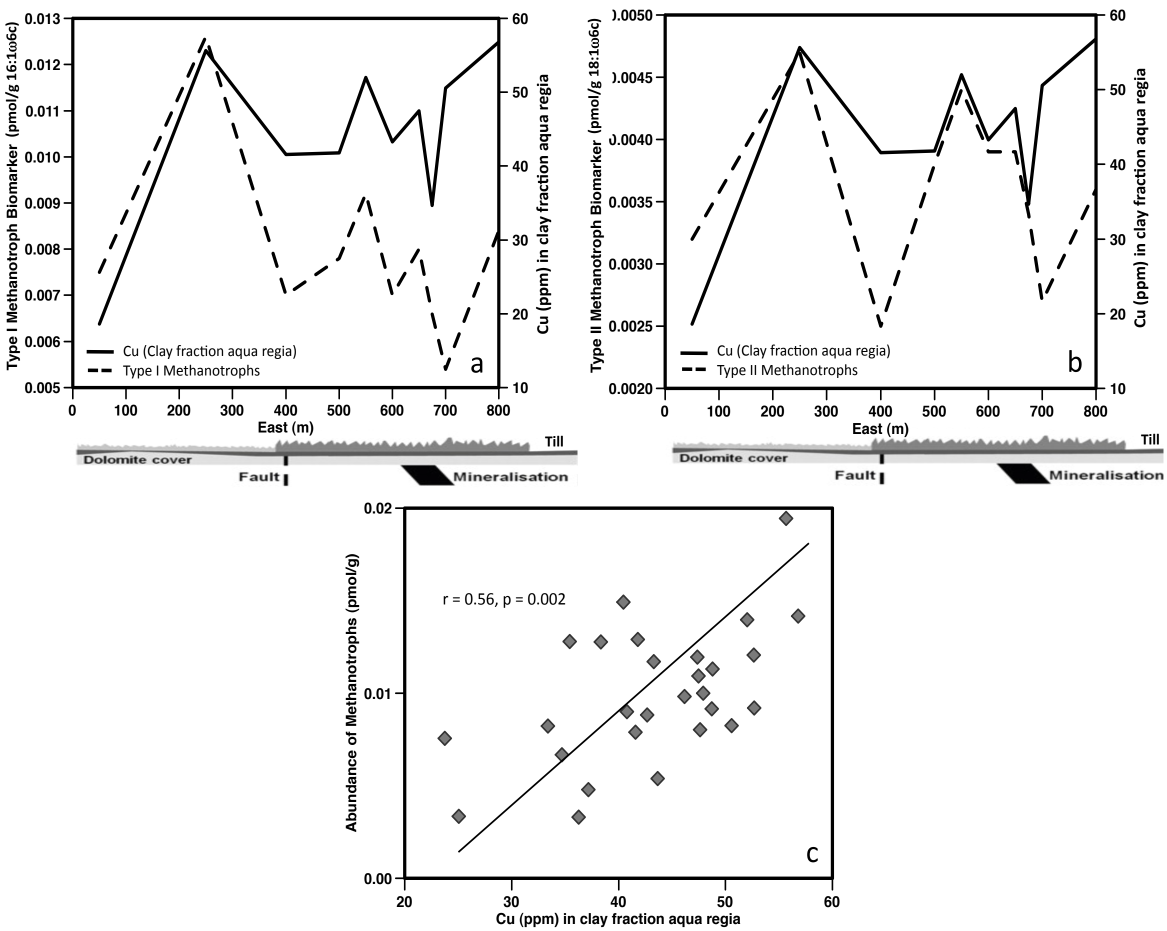


Figure 12: (a) Depth averaged abundance of Type I Methanotrophs, using signature lipid biomarker (SLB) *cis*-10-hexadecenoate (16:1ω6c), and Cu concentration in clay-size (<2μm) aqua regia along Talbot Line 2N. (b) Depth averaged abundance of Type II Methanotrophs using SLB *cis*-12-octadecenoate (18:1ω6c) and Cu concentration in clay-size (<2μm) aqua regia along Talbot Line 2N. (c) Pearson correlation of Cu in clay-size (<2μm) aqua regia and abundance of Methanotrophs (Type I and II) over the Talbot sampling grid.

To examine other element-microbe associations the abundance of sulfate reducing bacteria (SRB) versus sulfur concentration in the sodium-pyrophosphate extraction and iron-reducing bacteria versus iron concentration in the clay (<2μm size) fraction aqua regia extraction is shown in Figure 13. The signature lipid biomarkers (SLBs) for SRBs include 10-methyl hexadecenoate (10me16:0), *cis*-10-heptadecenoate (17:ω17c), and 10-methyl heptadecenoate (10me17:0). SLBs for Fe-reducers include *cis*-9-hexadecenoate (16:1ω7c) and 10-methyl hexadecenoate (10me16:0). The elemental concentrations are highest at the location of the fault and projection to mineralization, and correlate to slight lows in abundance of sulfate- and iron- reducing bacteria.

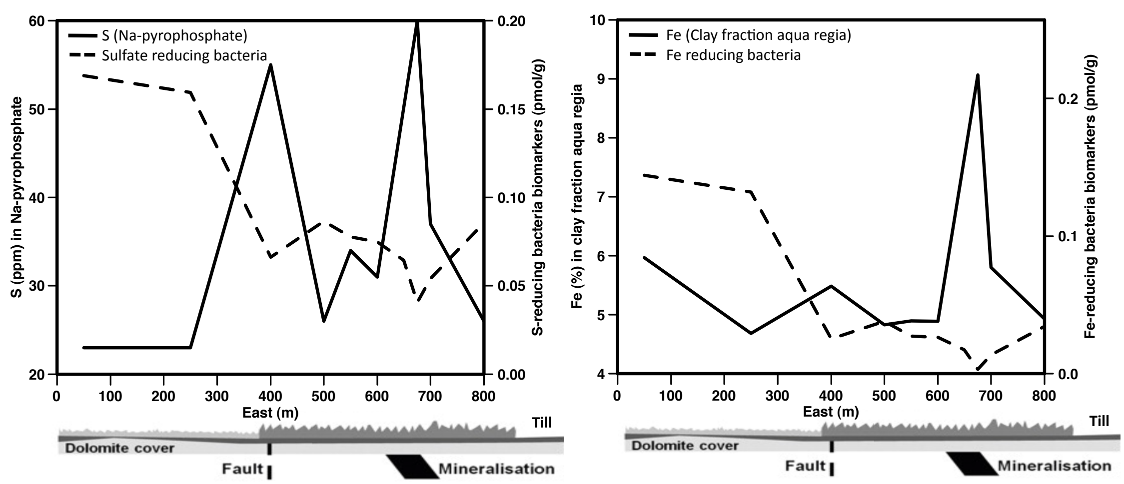


Figure 13: (a) Sulfur concentration in the sodium-pyrophosphate extraction and abundance of sulfate reducing bacteria (SRB) along Talbot Line 2N and (b) Iron concentration in the clay (<2μm size) fraction aqua regia extraction and abundance of Fe-reducing bacteria.

Diamond-mean plots illustrate t-tests, which evaluate whether the mean of two different populations are statistically different. The mean of the individual population tested is illustrated as the centre solid line of the diamonds and the upper and lower 95% percentile, or the overlap marks are labeled as smaller solid lines above and below the mean line. The dashed line signifies the overall mean of both populations. Populations are considered to be statistically different if the overlap marks fall on opposite sides of the overall mean.

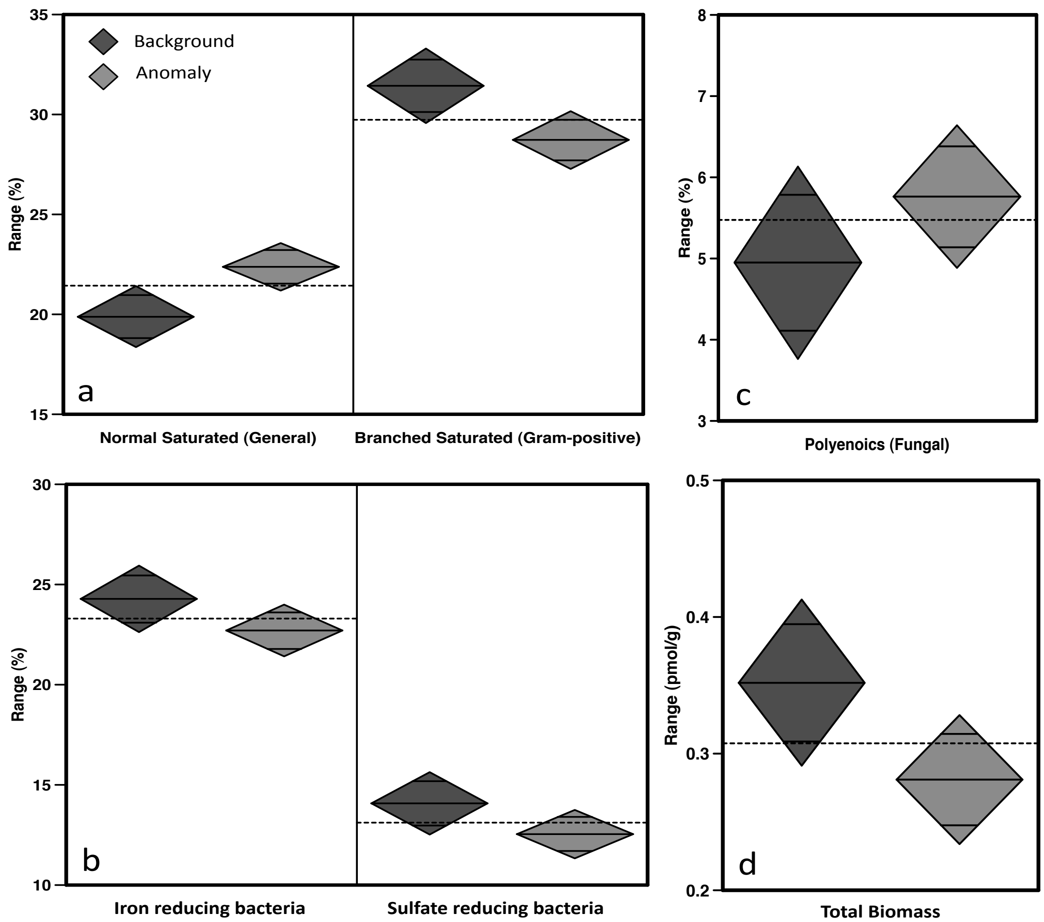


Figure 14: Diamond-mean plots of microbial abundance variables that are significantly different (as determined by t-test) at anomalous and background locations over the Talbot sampling grid. (a) Normal saturated and branched saturated structural groups, which represent general biomass and Gram-positive bacteria, respectively. (b) Signature lipid biomarkers (SLBs) for iron-reducing and sulfate-reducing bacteria. (c) Polyenoic structural group, indicative of fungal groups. (d) Total viable lipid biomass.

All PLFA structural groups, as well as all individual signature lipid biomarkers were tested for significant difference between background and anomalous locations. Variables that did not demonstrate a significant difference are not shown. The normal saturated PLFA structural group, which indicate the presence of general plant and microbial biomass, has a statistically higher mean at the anomalous locations, while the branched saturated structural group, which indicates the presence of Gram-positive bacteria, has a lower mean at the anomalous locations (Figure 14(a)). The signature lipid biomarkers that indicate the presence of iron-reducing and sulfate-reducing bacteria (both Gram-positive) also have lower means at the anomalous locations (Figure 14(b)). The polyenoic structural group (Figure 14(c)) has a slightly higher mean at the anomalous location. While the difference of the entire structural group is not statistically relevant, several of the individual biomarkers within the group do show a significantly higher mean at the anomalous locations. Total viable biomass at anomalous locations is statistically lower than background locations (Figure 14(d)).

## DISCUSSION

The presence and activity of microorganisms in the subsurface has been suggested to play a controlling factor in the mobility of elements in the subsurface and development of surficial geochemical anomalies (Coker, 2010). It has also been suggested that even in cases where indicator organisms are not known for the specific type of mineralization, differences in soil microbial ecology can be used as a tool along with geochemical methods in the search for deeply buried deposits (Melchior et al., 1996; Reith and Rogers, 2008).

In the current study, geochemical methods identified a structural fault and the surficial geochemical anomaly that developed due to the connectivity between the surface and the buried VMS deposit (van Geffen et al., 2012b). By combining geochemical and microbial techniques, the surficial anomaly at the projection to mineralization (Line2N-650E) is more readily identified. The anomaly at the intersection of the fault (Line2N-400E) is geochemically distinct from the other sampling locations. Anomalous concentrations of Zn are found in all the weak and clay fraction selective extractions (Figure 3) and isotopic composition of the clay fraction lacks carbonate input at the base of the profile (Figure 8), both of which suggest enhanced groundwater movement at that location. Microbiological analyses demonstrate an anomalously low abundance of bacteria at the fault (400E), but also reveal an anomaly at the projection of mineralization (650E) (Figure 6). The microbial community composition is also significantly different at the projection to mineralization: obligate anaerobes/Gram-positive bacteria abundance decreases, while fungi and general biomass (including plant-derived lipids) increases (Figure 9). This general change in distribution was documented to extend over the entire Talbot grid, when comparing background and anomalous locations (Figure 14). This result is in agreement with previous studies, where fungi and Gram-negative organisms dominate over Gram-positive in metal contaminated soils (Frostegard et al., 1993). It should be noted, however, that the increase in fungi abundance may be complicated by the fact that Cu is especially toxic to fungi (known fungicide) (Frostegard et al., 1993).

The microbial anomaly at the projection of mineralization (650E) suggests that its overlying anomaly may be due to oxidation of the buried sulfide at depth, and the movement of metals along the oxidation-reduction front in the subsurface. As would be expected if an electrochemical anomaly is developing, there is a pH high at 650E (Figure 6) (Hamilton et al., 2004a) and the elements related to the oxidation of sulfide (specifically Fe, Mo, and V (Bajc, 1998)) are at anomalous concentrations only at 650E (Figure 2). Anomalous concentrations of Zn at 650E are present only in the clay (<2μm size) fraction aqua regia and Na-pyrophosphate extractions (Figure 3), suggesting that the anomalous elements are only adsorbed to the organic carbon and clay at that location, and not in more readily exchangeable phases or incorporated into secondary minerals.

Sr and Pb isotopic compositions in both clay (<2um) and till (<250um) size fractions from Line2N (Figure 5), as determined by van Geffen (2011), show similar compositions at the intersection of the fault (400E) and the projection to mineralization (650E). At both locations the $^{87/86}Sr$ and $^{206}Pb/^{204}Pb$ values are indicative of the underlying carbonates and VMS, respectively. Isotopes, Pb in particular, have been found to be useful in geochemical exploration, as the isotopes are not altered in transport and have a distinct composition from the host rock (Simonetti et al., 1996; van Geffen, 2011). The similar Sr and Pb isotopic composition in the media at both 400E and 650E indicate that both locations are connected to the mineralization at depth.

Along Talbot Line2N, the microbial community is most unique at the projection to mineralization (650E), in terms of abundance (Figure 6), microbial community structure (Figure 9), and isotopic composition of individual PLFAs (Figure 9). The changes in microbial community structure are similar to results previously observed (Frostegard et al., 1993), wherein the total microbial abundance has been found to both increase and decrease with proximity to buried ore (Enders et al., 2006; Frostegard et al., 1993; Gough et al., 2008; Reith and Rogers, 2008; Wakelin et al., 2012). The high $\delta^{13}C$ in lipids is in disagreement with previously documented results (Cowie et al., 2009; Watzinger et al., 2008), but may indicate enhanced sulfide weathering. Generation of $H^+$ dissolves the overlying carbonate, increasing pH, and enriching the isotopic composition of $CO_2$ (Alpers et al., 1990). The carbonates overlying the basement rock have an isotopic composition of 0-2‰, and mixing with organic carbon (approximately -26‰) could generate isotopically enriched organic carbon and $CO_2$ for incorporation into microbial membranes. While the microbial community structure, growth phase and abundance seems to correlate to soil type (Figure 10) and soil organic matter (Figure 6 and 7), there is also a strong negative correlation between microbial abundance and Zn concentration in the clay (<2μm size) fraction, regardless of the other factors. This correlation is especially of interest in determining the surficial geochemical anomaly, as the anomalous locations associated with the fault plot above the trend, while anomalous locations in proximity to mineralization plot along the trend (Figure 11). Other studies have documented a similar negative correlation between Zn and microbial abundance (Gough et al., 2008). Based on these results, the clay (<2μm size) fraction was selected for comparison with the microbiological analyses, as a representation of the more mobile and reactive elements. It has been shown that total or near total extractions are not particularly well suited as the sample matrix dominates the signal and not the overprint related to elemental dispersion processes (Bajc, 1998). As total biomass is positively correlated with soil organic matter, and total biomass is negatively correlated with Zn concentration in the clay fraction, it can be concluded that Zn concentration may negatively correlate with soil organic matter. This is counter-intuitive, as the presence of more organic matter should allow for the sequestration of more mobile elements. However, similarly to Zn concentrations along Line 2N, there are anomalous amounts of phosphate at the intersection of the fault (400E) and the projected intersection of mineralization (650E). As these areas have the lowest amounts of soil organic matter and total microbial abundance and the highest concentrations of metals, it is possible that the anomalous amounts of phosphate are due to a lack of microbial activity. It has been previously documented that these levels of metals can be toxic (Frostegard et al., 1993; Gough et al., 2008), and correlations between microbial abundance and nutritional variables can be lacking in the environment (Bossio and Scow, 1995).

Along with the Zn-biomass correlation, methanotroph abundance correlates with Cu concentration in the clay (<2μm size) fraction aqua regia extraction. Methanotrophs need Cu, but this association has yet to be observed in the field (Knapp et al., 2007). This correlation can be of use in the combined geochemical/microbiological exploration of buried ore deposits, similar to the

*Bacillus cereus*/Au association (Parduhn, 1991; Reith et al., 2005), and indicates the possibility that other microorganisms may be found to be of use with other metals (e.g. methanogens and Ni (Hausrath et al., 2007)). The observed methanotroph-Cu correlation deserves further attention, as these organisms are not only associated with solid phase Cu concentrations, but will actively mobilize Cu, dissolving the mineral in the process (Kulczycki et al., 2007).

It has been suggested that S- and Fe-oxidizers are primarily responsible for weathering of ore at depth (Enders et al., 2006; Southam and Saunders, 2005), and that these organisms require oxygen and acidic conditions (although circumneutral organisms have been observed in the field (Mielke et al., 2003)). Correlations between Zn or Cu with specific microbes or their consortia suggests that there may be many more organisms under a variety of conditions that are capable of metal mobilization in the subsurface (Knapp et al., 2007; Kulczycki et al., 2007; Rogers and Bennett, 2004; Rogers et al., 1998).

Signature lipid biomarkers also identified inverse relationships between Fe concentration and abundance of Fe-reducing bacteria, and S concentration and abundance of sulfate-reducing bacteria along Line2N (Figure 13). This trend extended over the entire Talbot sampling grid (Figure 14(b)). While some studies have documented increased concentrations of these organisms directly overlying mineralization (Druschel et al., 2002; Enders et al., 2006; Labrenz et al., 2000; Mohagheghi et al., 1985), and attribute this to enhanced reducing conditions, in this study the inverse relationship documents the distinct geochemistry present at anomalous locations and further suggests that anomalous metal concentrations in the soil are due to enhanced metal mobility, and not enhanced secondary precipitation and subsequent metal sequestration.

## CONCLUSION

Geochemical and microbiological analyses at the Talbot prospect demonstrate the presence of two distinct anomalies: one due to the hydrologic connectivity along a fault, and the other most likely due to weathering of ore and mobility along electrochemical and gaseous gradients. While a specific microbial indicator species was not found, methanotrophs were identified as an indicator microbial guild for Cu. Total microbial abundance varies inversely with Zn concentration, and provided a tool for identifying anomalous sampling locations. Microbial community structure was significantly different between anomalous and background locations, and the same trends will most likely extend to other soils with high metal content. This study demonstrates the usefulness of microbiology in the exploration for buried mineral deposits. Microorganisms can affect the rate of weathering and mobilization of metals that results in specific biomass that can be recognized at the surface, however, more mechanistic studies are required to understand biogeochemical subsurface processes and surface anomalies.

## REFERENCES

Alpers, C.N., Dettman, D.L., Lohmann, K.C., and Brabec, D., 1990, Stable isotopes of carbon-dioxide in soil gas over massive sulfide mineralization at Crandon, Wisconsin Journal of Geochemical Exploration, v. 38, p. 69-86.

Arning, E.T., Birgel, D., Schulz-Vogt, H.N., Holmkvist, L., Jorgensen, B.B., Larson, A., and Peckmann, J., 2008, Lipid biomarker patterns of phosphogenic sediments from upwelling regions: Geomicrobiology Journal, v. 25, p. 69-82.

Bajc, A.F., 1998, A comparative analysis of enzyme leach and mobile metal ion selective extractions; case studies from glaciated terrain, northern Ontario: Journal of Geochemical Exploration, v. 61, p. 113-148.

Bawden, T.M., Einaudi, M.T., Bostick, B.C., Meibom, A., Wooden, J., Norby, J.W., Orobona, M.J.T., and Chamberlain, C.P., 2003, Extreme S-34 depletions in ZnS at the Mike gold deposit, Carlin Trend, Nevada: Evidence for bacteriogenic supergene sphalerite: Geology, v. 31, p. 913-916.

Bossio, D.A., and Scow, K.M., 1995, Impact of carbon and flooding on the metabolic diversity of microbial communities in soils Applied and Environmental Microbiology, v. 61, p. 4043-4050.

Cameron, E.M., Hamilton, S.M., Leybourne, M.I., Hall, G.E.M., and McClenaghan, M.B., 2004, Finding deeply buried deposits using geochemistry: Geochemistry-Exploration Environment Analysis, v. 4, p. 7-32.

Coker, W.B., 2010, Future research directions in exploration geochemistry: Geochemistry-Exploration Environment Analysis, v. 10, p. 75-80.

Cowie, B.R., Slater, G.F., Bernier, L., and Warren, L.A., 2009, Carbon isotope fractionation in phospholipid fatty acid biomarkers of bacteria and fungi native to an acid mine drainage lake: Organic Geochemistry, v. 40, p. 956-962.

Dexterdyer, B., Kretzschmar, M., and Krumbein, W.E., 1984, Possible microbial pathways in the formation of precambrian ore-deposits Journal of the Geological Society, v. 141, p. 251-262.

Ding, H., and Valentine, D.L., 2008, Methanotrophic bacteria occupy benthic microbial mats in shallow marine hydrocarbon seeps, Coal Oil Point, California: Journal of Geophysical Research-Biogeosciences, v. 113.

Druschel, G.K., Labrenz, M., Thomsen-Ebert, T., Fowle, D.A., and Banfield, J.F., 2002, Geochemical Modeling of ZnS in biofilms: An example of ore depositional processes: Economic Geology and the Bulletin of the Society of Economic Geologists, v. 97, p. 1319-1329.

Enders, M.S., Knickerbocker, C., Titley, S.R., and Southam, G., 2006, The role of bacteria in the supergene environment of the Morenci Porphyry Copper Deposit, Greenlee County, Arizona: Economic Geology, v. 101, p. 59-70.

Ferris, F.G., Fyfe, W.S., and Beveridge, T.J., 1987, Bacteria as nucleation sites for authigenic minerals in a metal-contaminated lake sediment Chemical Geology, v. 63, p. 225-232.

Findlay, R.H., King, G.M., and Watling, L., 1989, Efficacy of phospholipid analysis in determining microbial biomass in sediments Applied and Environmental Microbiology, v. 55, p. 2888-2893.

Frostegard, A., Tunlid, A., and Baath, E., 1993, Phospholipid fatty-acid composition, biomass, and activity of microbial communities from 2 soil types experimentally exposed to different heavy-metals Applied and Environmental Microbiology, v. 59, p. 3605-3617.

Fu, C.C., Yang, T.F., Walia, V., and Chen, C.H., 2005, Reconnaissance of soil gas composition over the buried fault and fracture zone in southern Taiwan: Geochemical Journal, v. 39, p. 427-439.

Gao, Y., Wang, M., and Zhang, D.-e., 2011, Application of 'metals-in-soil-gas' techniques to mineral exploration in exotic overburden: Geochemistry-Exploration Environment Analysis, v. 11, p. 63-70.

Garuti, G., Alfonso, P., Proenza, J.A., and Zaccarini, F., 2009, Sulfur-isotope variations in sulfide minerals from massive sulfide deposits of the Northern Apennine Ophiolites: inorganic and biogenic constraints: Ofioliti, v. 34, p. 43-62.

Gilliss, M.L., Al, T.A., Blowes, D.W., Hall, G.E.M., and MacLean, B., 2004, Geochemical dispersion in groundwater from a weathered Cu-Zn deposit in glaciated terrain: Geochemistry-Exploration Environment Analysis, v. 4, p. 291-305.

Goodhue, L.D., Hamilton, S., and Southam, G., 2005, The geomicrobiology of surficial geochemical anomalies: Geochimica Et Cosmochimica Acta, v. 69, p. A367-A367.

Gough, H.L., Dahl, A.L., Nolan, M.A., Gaillard, J.-F., and Stahl, D.A., 2008, Metal impacts on microbial biomass in the anoxic sediments of a contaminated lake: Journal of Geophysical Research-Biogeosciences, v. 113.

Green, C.T., and Scow, K.M., 2000, Analysis of phospholipid fatty acids (PLFA) to characterize microbial communities in aquifers: Hydrogeology Journal, v. 8, p. 126-141.

Guckert, J.B., Hood, M.A., and White, D.C., 1986, Phospholipid ester-linked fatty-acid profile changes during nutrient deprivation of vibrio cholerae - Increases in the trans/cis ratio and proportions of cyclopropyl fatty acids: Applied and Environmental Microbiology, v. 52, p. 794-801.

Hamilton, S.M., 1998, Electrochemical mass-transport in overburden: a new model to account for the formation of selective leach geochemical anomalies in glacial terrain: Journal of Geochemical Exploration, v. 63, p. 155-172.

Hamilton, S.M., Cameron, E.M., McClenaghan, M.B., and Hall, G.E.M., 2004a, Redox, pH and SP variation over mineralization in thick glacial overburden. Part I: methodologies and field investigation at the Marsh Zone gold property: Geochemistry-Exploration Environment Analysis, v. 4, p. 33-44.

—, 2004b, Redox, pH and SP variation over mineralization in thick glacial overburden. Part II: field investigation at Cross Lake VMS property: Geochemistry-Exploration Environment Analysis, v. 4, p. 45-58.

Hausrath, E.M., Liermann, L.J., House, C.H., Ferry, J.G., and Brantley, S.L., 2007, The effect of methanogen growth on mineral substrates: will Ni markers of methanogen-based communities be detectable in the rock record?: Geobiology, v. 5, p. 49-61.

Heiri, O., Lotter, A.F., and Lemcke, G., 2001, Loss on ignition as a method for estimating organic and carbonate content in sediments: reproducibility and comparability of results: Journal of Paleolimnology, v. 25, p. 101-110.

Kelley, D.L., Kelley, K.D., Coker, W.B., Caughlin, B., and Doherty, M.E., 2006, Beyond the obvious limits of ore deposits: The use of mineralogical, geochemical, and biological features for the remote detection of mineralization: Economic Geology, v. 101, p. 729-752.

Knapp, C.W., Fowle, D.A., Kulczycki, E., Roberts, J.A., and Graham, D.W., 2007, Methane monooxygenase gene expression mediated by methanobactin in the presence of mineral copper sources: Proceedings of the National Academy of Sciences of the United States of America, v. 104, p. 12040-12045.

Kulczycki, E., Fowle, D.A., Knapp, C., Graham, D.W., and Roberts, J.A., 2007, Methanobactin-promoted dissolution of Cu-substituted borosilicate glass: Geobiology, v. 5, p. 251-263.

Labrenz, M., Druschel, G.K., Thomsen-Ebert, T., Gilbert, B., Welch, S.A., Kemner, K.M., Logan, G.A., Summons, R.E., De Stasio, G., Bond, P.L., Lai, B., Kelly, S.D., and Banfield, J.F., 2000, Formation of sphalerite (ZnS) deposits in natural biofilms of sulfate-reducing bacteria: Science, v. 290, p. 1744-1747.

Lollar, B.S., Lacrampe-Couloume, G., Slater, G.F., Ward, J., Moser, D.P., Gihring, T.M., Lin, L.H., and Onstott, T.C., 2006, Unravelling abiogenic and biogenic sources of methane in the Earth's deep subsurface: Chemical Geology, v. 226, p. 328-339.

Ludvigsen, L., Albrechtsen, H.J., Ringelberg, D.B., Ekelund, F., and Christensen, T.H., 1999, Distribution and composition of microbial populations in landfill leachate contaminated aquifer (Grindsted, Denmark): Microbial Ecology, v. 37, p. 197-207.

Macalady, J.L., Mack, E.E., Nelson, D.C., and Scow, K.M., 2000, Sediment microbial community structure and mercury methylation in mercury-polluted Clear Lake, California: Applied and Environmental Microbiology, v. 66, p. 1479-1488.

Malmqvist, L., Kristiansson, K., and Kristiansson, P., 1999, Geogas prospecting - an ideal industrial application of PIXE: Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms, v. 150, p. 484-490.

Mann, A.W., Birrell, R.D., Fedikow, M.A.F., and de Souza, H.A.F., 2005, Vertical ionic migration: mechanisms, soil anomalies, and sampling depth for mineral exploration: Geochemistry-Exploration Environment Analysis, v. 5, p. 201-210.

Melchior, A., Dejonghe, L., and Hughes, G., 1996, A geomicrobiological study of soils collected from auriferous areas of Argentina: Journal of Geochemical Exploration, v. 56, p. 219-227.

Mielke, R.E., Pace, D.L., Porter, T., and Southam, G., 2003, A critical stage in the formation of acid mine drainage: Colonization of pyrite by Acidithiobacillus ferrooxidans under pH-neutral conditions: Geobiology, v. 1, p. 81-90.

Mohagheghi, A., Updegraff, D.M., and Goldhaber, M.B., 1985, The role of sulfate reducing bacteria in the deposition of sedimentary uranium ores: Geomicrobiology Journal, v. 4, p. 153-173.

Mossman, D.J., Reimer, T., and Durstling, H., 1999, Microbial processes in gold migration and deposition: Modern analogues to ancient deposits: Geoscience Canada, v. 26, p. 131-140.

Nelson, M.A., Kyser, T.K., Clark, A.H., and Oates, C., 2009, Application of carbon isotope ratios in regolith to the exploration for buried exotic-type copper ore deposits, Collahuasi district, northern Chile: Geochemistry-Exploration Environment Analysis, v. 9, p. 3-8.

Parduhn, N.L., 1991, A microbial method of mineral exploration - A case-history at the Mesquite deposit Journal of Geochemical Exploration, v. 41, p. 137-149.

Polito, P., Kyser, K., Lawie, D., Cook, S., and Oates, C., 2007, Application of sulphur isotopes to discriminate Cu-ZnVHMS mineralization from barren Fe sulphide mineralization in the greenschist to granulite facies Flin Flon-Snow Lake-Hargrave River region, Manitoba, Canada: Geochemistry-Exploration Environment Analysis, v. 7, p. 129-138.

Rainbow, A., Kyser, T.K., and Clark, A.H., 2006, Isotopic evidence for microbial activity during supergene oxidation of a high-sulfidation epithermal Au-Ag deposit: Geology, v. 34, p. 269-272.

Rajendran, N., Matsuda, O., Rajendran, R., and Urushigawa, Y., 1997, Comparative description of microbial community structure in surface sediments of eutrophic bays: Marine Pollution Bulletin, v. 34, p. 26-33.

Reith, F., Lengke, M.F., Falconer, D., Craw, D., and Southam, G., 2007, The geomicrobiology of gold: Isme Journal, v. 1, p. 567-584.

Reith, F., McPhail, D.C., and Christy, A.G., 2005, Bacillus cereus, gold and associated elements in soil and other regolith samples from Tomakin Park Gold Mine in southeastern New South Wales, Australia: Journal of Geochemical Exploration, v. 85, p. 81-98.

Reith, F., and Rogers, S.L., 2008, Assessment of bacterial communities in auriferous and non-auriferous soils using genetic and functional fingerprinting: Geomicrobiology Journal, v. 25, p. 203-215.

Rogers, J.R., and Bennett, P.C., 2004, Mineral stimulation of subsurface microorganisms: release of limiting nutrients from silicates: Chemical Geology, v. 203, p. 91-108.

Rogers, J.R., Bennett, P.C., and Choi, W.J., 1998, Feldspars as a source of nutrients for microorganisms: American Mineralogist, v. 83, p. 1532-1540.

Sillitoe, R.H., Folk, R.L., and Saric, N., 1996, Bacteria as mediators of copper sulfide enrichment during weathering: Science, v. 272, p. 1153-1155.

Simonetti, A., Bell, K., and Hall, G.E.M., 1996, Pb isotopic ratios and elemental abundances for selective leachates from near-surface till: Implications for mineral exploration: Applied Geochemistry, v. 11, p. 721-734.

Smee, B.W., 1998, A new theory to explain the formation of soil geochemical responses over deeply covered gold mineralization in arid environments: Journal of Geochemical Exploration, v. 61, p. 149-172.

Southam, G., and Saunders, J.A., 2005, The geomicrobiology of ore deposits: Economic Geology, v. 100, p. 1067-1084.

Sturm, A., Crowe, S.A., and Fowle, D.A., 2008, Trace lead impacts biomineralization pathways during bacterial iron reduction: Chemical Geology, v. 249, p. 282-293.

Townley, B., Puig, A., Ojeda, G., Luca, R., Vargas, T., LeRoux, J., 2007, Understanding real time processes behind the development of surface geochemical expressions from ore bodies beneath cover: source to surface and detection by means of collector devices, *in* Milkereit, B., ed., Proceedings of Exploration 07; Fifth Decennial International Conference on Mineral Exploration, p. 1019-1021.

van Geffen, P., 2011, Geochemical indicators of buried sulphide mineralisation under sedimentary cover near Talbot Lake, Manitoba: Kingston, Queen's University.

van Geffen, P.W.G., Kyser, T.K., Oates, C.J., and Ihlenfeld, C., 2012a, Evaluation of partial digests for soils to detect a deeply buried VMS Cu-Zn prospect in boreal forests: Manuscript submitted for publication.

—, 2012b, Till and vegetation geochemistry at the Talbot VMS Cu-Zn prospect, Manitoba, Canada: implications for mineral exploration: Geochemistry-Exploration Environment Analysis, v. 12, p. 67-86.

Wakelin, S., Anand, R.R., Macfarlane, C., Reith, F., Noble, R., and Rogers, S., 2012, Assessing microbiological surface expression over an overburden-covered VMS deposit: Journal of Geochemical Exploration, v. 112, p. 262-271.

Watzinger, A., Stemmer, M., Pfeffer, M., Rasche, F., and Reichenauer, T.G., 2008, Methanotrophic communities in a landfill cover soil as revealed by C-13 PLFAs and respiratory quinones: Impact of high methane addition and landfill leachate irrigation: Soil Biology & Biochemistry, v. 40, p. 751-762.

White, D.C., Davis, W.M., Nickels, J.S., King, J.D., and Bobbie, R.J., 1979, Determination of the sedimentary microbial biomass by extractable lipid phosphate Oecologia, v. 40, p. 51-62.

White, T., Bursten, S., Federighi, D., Lewis, R.A., and Nudelman, E., 1998, High-resolution separation and quantification of neutral lipid and phospholipid species in mammalian cells and sera by multi-one-dimensional thin-layer chromatography: Analytical Biochemistry, v. 258, p. 109-117.

# CHAPTER 4. BIOGEOCHEMICAL CONTROLS ON METAL MOBILITY: MODELING A CU-ZN VMS DEPOSIT IN COLUMN FLOW-THROUGH STUDIES

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ABSTRACT

An economic Cu-Zn volcanogenic massive sulfide (VMS) deposit was modeled in flow-through columns to examine the microbial controls on ore weathering and soil anomaly development. The presence of microorganisms, especially S-oxidizing bacteria and Fe-oxidizing bacteria, increased the rate of weathering and metal release from ore. To examine the development of soil metal anomalies overlying the VMS deposit, flow-through experiments modeling the full overburden profile were completed. Selective extractions on the soil demonstrated that enhanced metal anomalies in the biotic column were developing in the reactive Fe- and Mn- oxide phases. These experimental results are linked to *in situ* biogeochemical processes through the use of a Fe-oxidizing isolate from the deep subsurface of Triple 7 Cu-Zn VMS mine in Flin Flon, Manitoba, Canada, in direct proximity to where the ore material was collected. These results demonstrate that the rates of metal mobility in the subsurface and soil metal anomaly development at the surface are increased

by the presence and activity of microorganisms when compared to control experiments.

## INTRODUCTION

In the search for deeply buried ore deposits a variety of exploration tools have been utilized, including isotopic anomalies (Cameron et al., 2004; Kelley et al., 2006; Polito et al., 2007; Simonetti et al., 1996), accumulation zones of mobile indicator metals (Bajc, 1998; Gilliss et al., 2004), zones of anomalous pH (Smee, 1998), high redox contrast (Hamilton et al., 2004a, b), vegetation type and metal content (Anand, 2007; van Geffen et al., 2012), gas flux (Alpers et al., 1990; Fu et al., 2005; Gao et al., 2011; Lollar et al., 2006; Malmqvist et al., 1999), and soil microbiology (Melchior et al., 1996; Parduhn, 1991; Reith et al., 2005; Reith and Rogers, 2008; Wakelin et al., 2012). While there are many proposed models for the formation of these secondary features, including electrochemical processes, expulsion of groundwater, dispersion of gas, and glacial rebound (Cameron et al., 2004; Kelley et al., 2006), the microbiological mechanisms that can influence transport of metals and generation of these features remain unknown (Wakelin et al., 2012).

Bacteria have an incredible molecular diversity, and with that diversity a range of metabolic capability. This has provided them with the inherent ability to greatly affect the geochemistry of their surroundings, which ranges from the surface to the deep subsurface (Southam and Saunders, 2005). Some of the biogeochemical processes that can influence metal mobility in the subsurface and the generation of geochemical anomalies at the surface include: mineral dissolution and weathering, gas generation, secondary mineral precipitation, changes in oxidation-reduction potential, generation of volatile metal complexes, and isotopic fractionations (Kelley et al., 2006; Lollar et al., 2006; Southam and Saunders, 2005). In the subsurface, enhanced metal release and mobility by microbial oxidation has been documented for a variety of redox active mineral phases (Southam and Saunders, 2005). Oxidation of sulfide minerals and the subsequent release of metals (Cu, Zn, Au, Ag, Pb, etc) are enhanced by respiration of Fe- and S-oxidizers (Enders et al., 2006; Mielke et al., 2003; Sillitoe et al., 1996). Some microorganisms have specific and high requirements for elements, for example methanotrophs utilize Cu in their methane oxidizing enzymes (Kulczycki et al., 2007) whereas methanogens require Ni for methane production(Hausrath et al., 2007), thereby decreasing the activity of these elements in solution. This, in turn, provides a driving force to increase the rate of dissolution for minerals containing these elements. Many microorganisms are able to extract nutrients directly from solid phase, including Fe, P, Cu, Zn, Ni, and Co (Hassen, 1998), using strategies such as ligand synthesis, pH gradients and release of extracellular enzymes , which promotes dissolution of the mineral structure (Rogers and Bennett, 2004; Rogers et al., 1998). Furthermore, many microbial metabolisms generate gas as a byproduct and can generate volatile metal complexes to detoxify their surroundings, all of which can lead to metal mobility in the subsurface (Kelley et al., 2006; Southam and Saunders, 2005).

Biogeochemical processes also have the ability to enhance and preserve the formation of surficial geochemical anomalies. The formation of secondary biogenic minerals, especially Fe (III)-minerals and clay minerals which have a high surface area, have tremendous ability to absorb trace metals that have been transported to the surface (Southam and Saunders, 2005; Sturm et al., 2008; van Geffen et al., 2012). Sulfate reducing bacteria have also been implicated in supergene enrichment (Enders et al., 2006) and secondary sulfide precipitation (Bawden et al., 2003). The change in geochemistry overlying buried mineralization has also been found to influence the soil microbial ecology (Wakelin et al., 2012), in some cases a specific microbe-metal association exists (Parduhn, 1991), so that the microbial ecology itself can serve as a surficial anomaly.

The purpose of the present research is to investigate the geomicrobiological controls on metal mobility and surficial anomaly development through the use of flow through columns that mimic Cu-Zn VMS deposits and their overburden. While flow-though column studies of arid Cu deposits and the associated overburden have been previously completed, and extensive biogeochemical processes visibly occurred, the identity of the microorganisms present and their underlying biogeochemical processes were not examined (Townley et al., 2007). Numerous investigations have examined the metal-microbe association in surficial soils overlying a variety of mineralization types, including Cu-Zn VMS (Wakelin et al., 2012), porphyry Cu (Enders et al., 2006) and Au deposits (Parduhn, 1991; Reith and McPhail, 2007; Reith et al., 2005), however, mechanisms of the metal-microbe association directly at buried Cu-Zn VMS mineralization remains enigmatic (Southam and Saunders, 2005).

In an effort to approximate the geologic setting for controlled study, a specific Cu-Zn VMS deposit was selected for the column flow-through experiments. As microbe-VMS ore associations are currently not well understood, direct underground sampling for ore material and indigenous microorganisms was completed for use in the column flow-through experiments at the Cu-Zn mine Triple 7, Flin Flon, Canada (Figure 1). Soil and carbonate overburden were collected from the Talbot prospect (Figure 1), located 200km away in an effort to reduce metal contamination by the Flin Flon smelter.

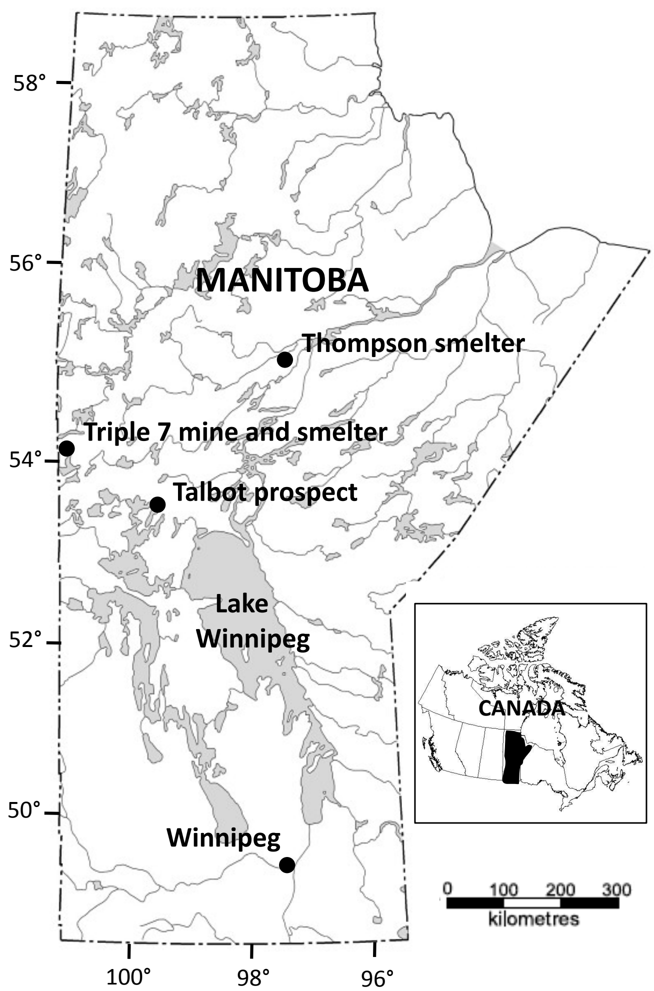



Figure 1: Location map of Flin Flon (Triple 7 mine) and Talbot (prospect), Manitoba, Canada.

Triple 7 mine is a Cu-Zn volcanogenic massive sulfide (VMS) containing 2.5% Cu and 4.6% Zn (Polito et al., 2007). The massive sulfide lenses consist of pyrite, sphalerite, chalcopyrite, pyrrhotite, pyrite and magnetite (Polito et al., 2007). The carbonate material consists of fractured chert-rich Paleozoic dolomite, and the soil is carbonate-rich silty glacial till (van Geffen et al., 2012). An extensive exploration program has been completed at the Talbot prospect, including drilling and geochemical surveys of soil and vegetation to delineate the surficial anomaly (van Geffen et al., 2012), and microbiological surveys to examine the microbial-metal association present at surface (Leslie et al., 2012b).

## METHODS

Column flow-through experiments were completed by modeling a Cu-Zn VMS deposit, based on ore collected from Triple 7 mine, Flin Flon, Manitoba, Canada, with overburden consisting of carbonate and soil from the Talbot Lake prospect within proximity to the mine. Three separate experiments were completed, full profile large (30 x 90cm) columns (Figure 2), full profile small (5 x 15cm) columns, and ore-only small (5 x 15cm) columns (Figure 3).

All of these experiments were carried out with influent at the column base and effluent at the top side-port. The influent for all experiments was deionised water augmented with NaCl (0.4mmol), $CaCl_2$ (0.2mmol), $NaHCO_3$ (0.2mmol), $MgCl_2$ (0.1mmol), $K_2SO_4$ (0.1mmol) and various organic carbon sources, including pyruvate, lactate and acetate (0.1mmol) (Appendix D). The small column experiments had a flow-through rate of approximately 10mL/day, and the large columns approximately 100mL/day. Columns were cleaned with HCl, and all fittings and tubing were autoclaved prior to setup. The fill material was not sterilized, as initial tests demonstrated that the sterilization process created much more reactive surface properties. All columns were dry-packed with crushed and sieved material. All the materials were sieved to <200μm, however, 200-300μm quartz sand was added to the carbonate. The columns were given several weeks with influent flowing to allow sufficient removable of air and surface contaminants. At this point, biotic columns were inoculated with a culture (Table 1) that had been washed five times with DI and concentrated by centrifugation.

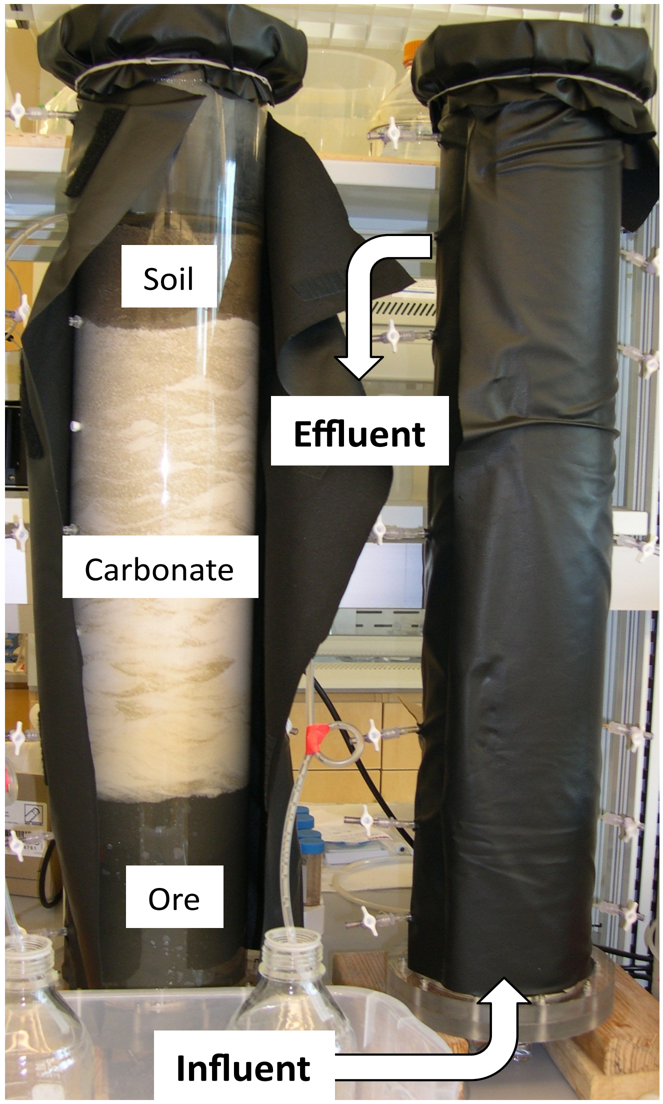



Figure 2: Large column flow-through experimental set-up for Talbot/Triple 7.

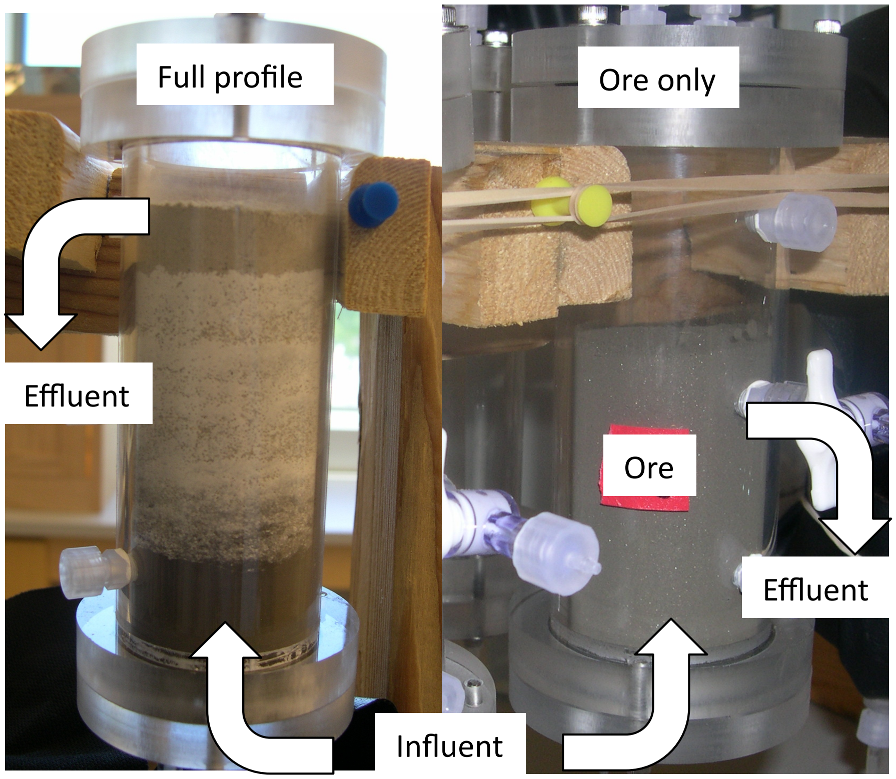



Figure 3: Small column full profile and ore-only flow-through experimental set-up.

Effluent was collected from all columns, filtered with 0.45μm syringe filters and acidified to 2% with Trace Metal Grade nitric acid. Samples were diluted to 10 and 100 times and analyzed by ICP-OES (Perkin Elmer Optima 5300DV). Aliquots for anions were collected, filtered, and analyzed at ACME Analytical Laboratories (Vancouver, Canada). The effluent from large columns was monitored by-weekly for changes in pH, Eh and conductivity, using Microelectrodes Inc (New Hampshire, USA) flow-through probes and eDAQ (Denistone, Australia) e-corder and quad-stat.

Small column full profile flow-through experiments ran for 4 weeks, while the large column full profile flow-through experiments ran for 40 weeks. At the termination of the flow-through column experiments, the fill material was separated by depth and material type, collected using sterile methods, freeze-dried, and stored at -80°C. Samples were sent to ACME Analytical Laboratories (Vancouver, Canada) for sequential extractions: demineralized water leach for extracting the water-soluble component, 1M ammonium acetate leach for exchangeable cations adsorbed by clay and elements co-precipitated with carbonate, 0.1M sodium pyrophosphate leach for elements adsorbed by organic matter (humic and fulvic compounds), 0.1 M hydroxylamine leach for elements adsorbed by amorphous Mn hydroxide (often the most reactive soil phase for scavenging mobile elements), 0.25 M hydroxylamine leach for elements adsorbed by amorphous Fe hydroxide and more crystalline Mn hydroxide, and aqua regia (1:3 $HNO_3$-HCl) for more complete digestion. A 1M HCl extraction was also completed at KU, and analyzed by ICP-OES. Samples were sent to Queen's University (Kingston, Canada) for isotopic analyses, specifically $\delta^{13}C$ and $\delta^{18}O$ on the overburden and $\delta^{34}S$ on the ore.

Table 1. Inoculation design for large column flow-through experiments

| **Organism metabolism** | **Organism name** |
|---|---|
| S-oxidizer | *Acidithiobacillus thiooxidans (ATCC 19377)* |
| Fe-oxidizer/Heterotroph | *Marinobacter* isolate |
| S-, Fe-oxidizer | *Acidithiobacillus ferrooxidans (ATCC 13598)* |
| Fe-reducer | *Geobacter metallireducens (ATCC 53774)* |
| S-reducer | *Desulfovibrio desulfuricans (ATCC 13541)* |
| Methanotroph | *Methylococcus capsulatus (ATCC 19069), Methylosinus trichosporium(ATCC 49242)* |
| Methanogen | *Methanobacterium formicicum (ATCC 33274)* |

Organic matter was determined on the soil phase of all columns by loss on ignition (Heiri et al., 2001). Briefly, dried samples were weighed into crucibles and subjected to 550°C for 4 hours. Cooled samples were re-weighed; the weight difference was used to calculate the soil organic matter content. Total Biomass was determined on all the soil zones in duplicate. Briefly, 5-10 g of soil was weighed and lipids were extracted with a single-phase chloroform-methanol-buffer (1:2:1 v/v/v) (White et al., 1979). After storage at 4°C in the dark for 24hr, the lipid-containing layer was separated by the addition of chloroform and water. This mixture was again stored at 4°C in the dark for 24hr, and the lipid-containing layer was filtered and recovered. Phosphate was liberated by potassium persulfate digestion in sealed ampoules at 95°C overnight. Phosphate concentrations were determined spectrophotometrically after the addition of ammonium molybdate and malachite green (Findlay et al., 1989).

## RESULTS

### *Small column ore-only experiments*

Element concentrations in the small column ore-only effluents were analyzed over the duration of the experiment (Figure 4). The concentration of Zn in the effluent was highest in the column inoculated with only an S-oxidizer, with high values approaching 1mmol. The next highest values of Zn in the effluent (800μmol) occurred in the column inoculated with a Fe-oxidizer (isolate) only. While Zn release by the mixed culture column did not rise above 400μmol, Zn release was more constant and maintained higher values of approximately 80 μmol towards the termination of the experiment. Concentrations of Zn in the control column effluent were never more than 100μmol.

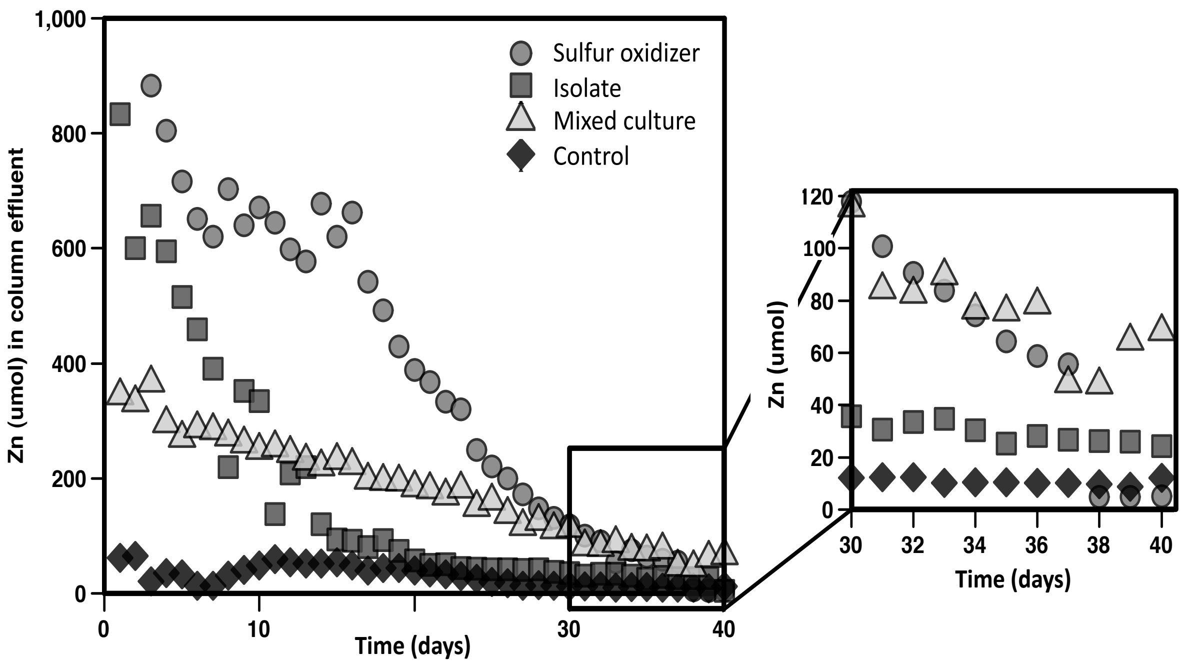



Figure 4: Zn concentration in small column Triple 7 ore only effluent over the duration of the flow-through experiment.

*Small column full profile experiments*

The small column full profile flow-through experiments were inoculated with the mixed culture, and both the biotic and control columns were completed in triplicate. There were no significant differences in the element concentrations in the effluent of the control and biotic columns (Figure 5). The only exceptions are slightly higher concentrations of Cu (1μmol in the control and 0.1μmol in the biotic column) and Zn (35μmol in the control and 10μmol in the biotic column) in the control column at the initiation of the flow-through experiment, and slightly higher Fe concentration (1-2μmol) in the biotic column.

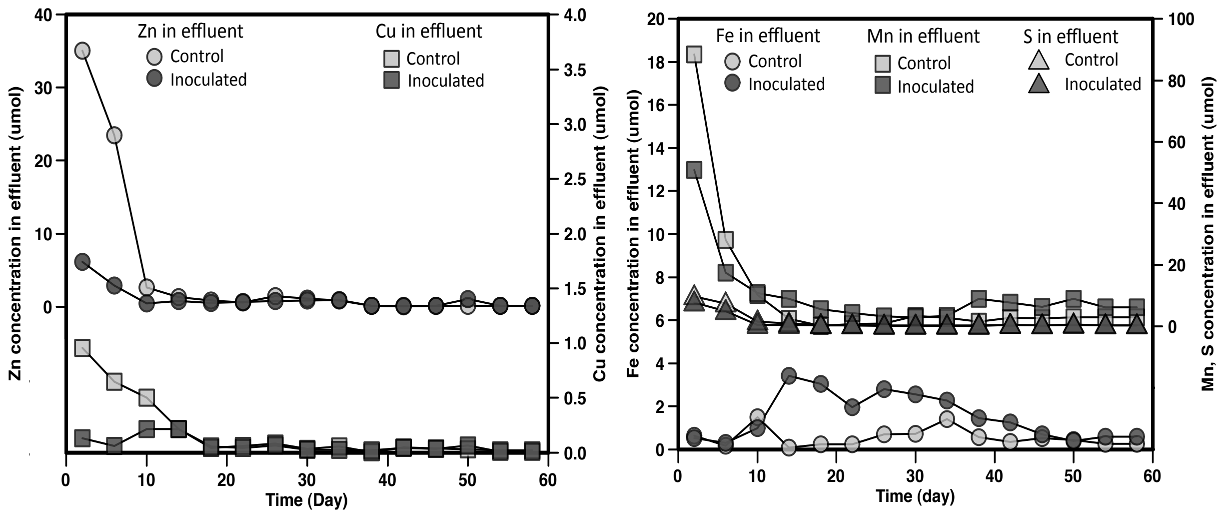



Figure 5: Elemental concentrations in Talbot/Triple 7 small column flow-through effluent over the duration of the small column flow-through experiment.

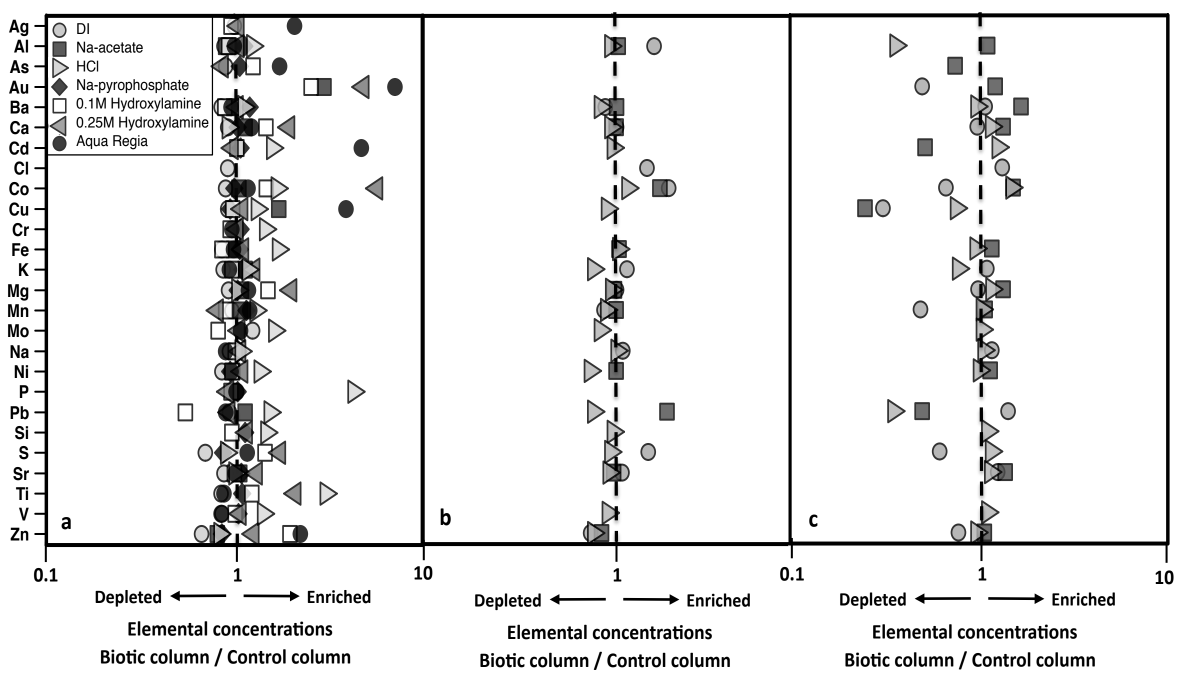



Figure 6: Solid phase extractions on small columns a) soil b) top of carbonate c) bottom of carbonate profile. Results are presented as concentration in biotic column normalized by concentration in control column.

Average solid phase metal contents in the biotic column normalized to the control column concentrations in the HCl and aqua regia extractions of the soil indicate there are enrichments in Ag, As, Au, Cd, Co, Cu, P, Ti and Zn as a result of microbial activity (Figure 6). The Cu and Zn contents as a function of depth (Figure 7) show that most enrichments in the biotic column occurred in the soil zone, but enrichment in the biomass occurred at the middle depth in the carbonate profile. The isotopic composition of the ore zone and the carbonate zone of the column were the same in all columns, $\delta^{34}S$ = 1‰ and $\delta^{13}C$ = 0‰, but the $\delta^{13}C$ of the biotic column soil zone was -11‰, much lower than in the control column, which was -5‰.

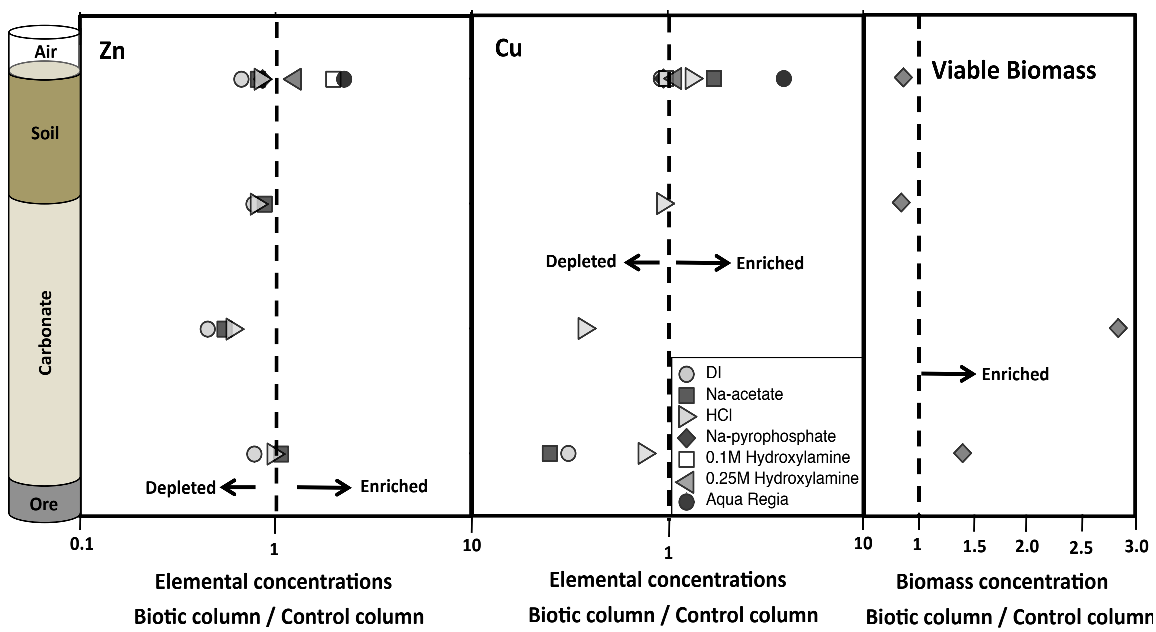



Figure 7: Zn and Cu solid phase elemental composition and total viable microbial biomass along the depth profiles of the small columns. Results are presented as concentration in biotic column normalized by concentration in control column.

*Large column full profile experiments*

The concentrations of Zn, Cu, Pb, S, Si, Fe and Mn in the large column full profile effluents were monitored over the duration of the flow-through experiments (Figure 8).

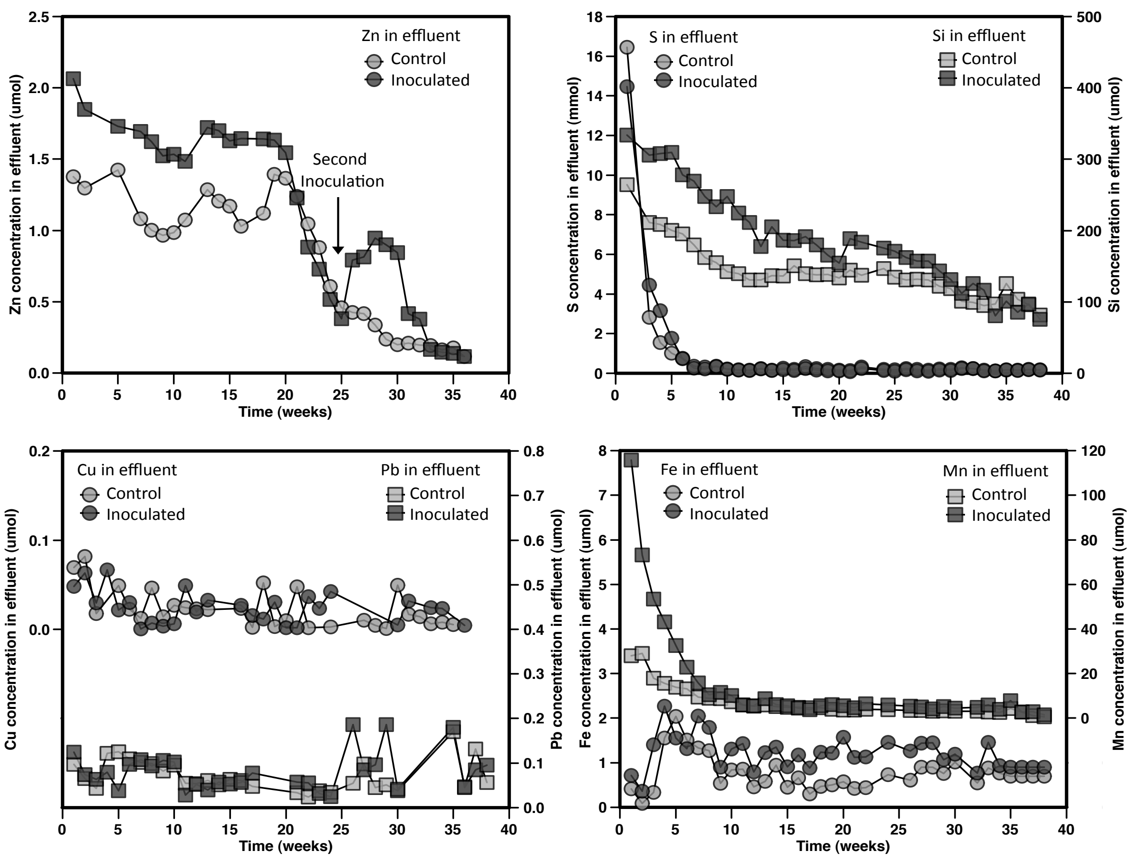



Figure 8: Elemental concentrations in Talbot/Tripe 7 large column flow-through effluent over time.

For most elements, the concentrations in the effluent of the inoculated column are not different from the control column. The only exceptions include Zn, Si, Fe and Mn, especially near the initiation of the flow-through experiment. These elements had a higher concentration in the biotic column effluent, Zn by 0.5μmol, Si by 100μmol, Fe by 1μmol and Mn by 40μmol. After 20 weeks, all elements reached equivalent concentrations in the effluent of the biotic and control columns. At 25 weeks a secondary inoculation of the mixed culture was introduced, and once again Zn concentration increased by 0.5μmol in the effluent of the biotic column.

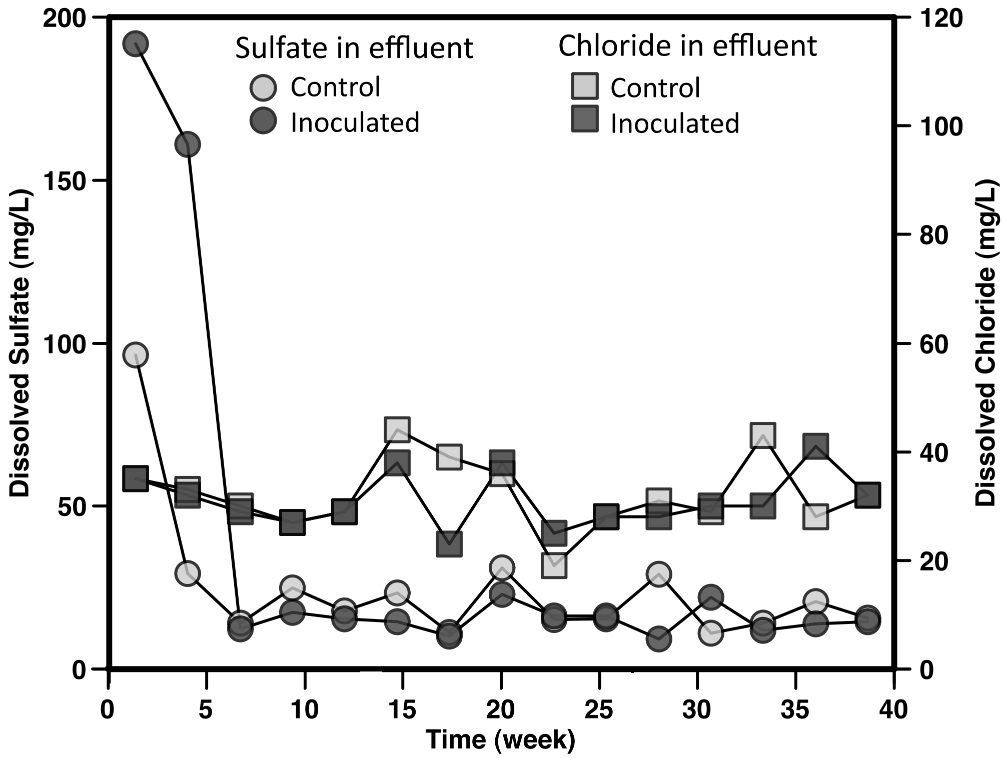



Figure 9: Anion concentrations in Talbot/Triple 7 large column flow-through effluent over the duration of the experiment.

Concentrations of the anions chloride and sulfate in the column effluents were not significantly different between the biotic and control columns, averaging 35mg/L and 25mg/L, respectively (Figure 9). The exception is sulfate, which was approximately 100mg/L higher in the inoculated column during the initial two weeks of the experiment. Nitrate, nitrite and orthophosphate were below detection in both of the column effluents, 0.2 mg/L, 0.2 mg/L and 0.005 mg/L, respectively. Eh and conductivity in the effluents were not different between the biotic and control columns (Figure 10). The pH of the biotic column effluent started at 6.3 and rose to 8.0 over the duration of the flow-through experiment, while the control column started at 7.0 and rose to 8.0 (Figure 10).

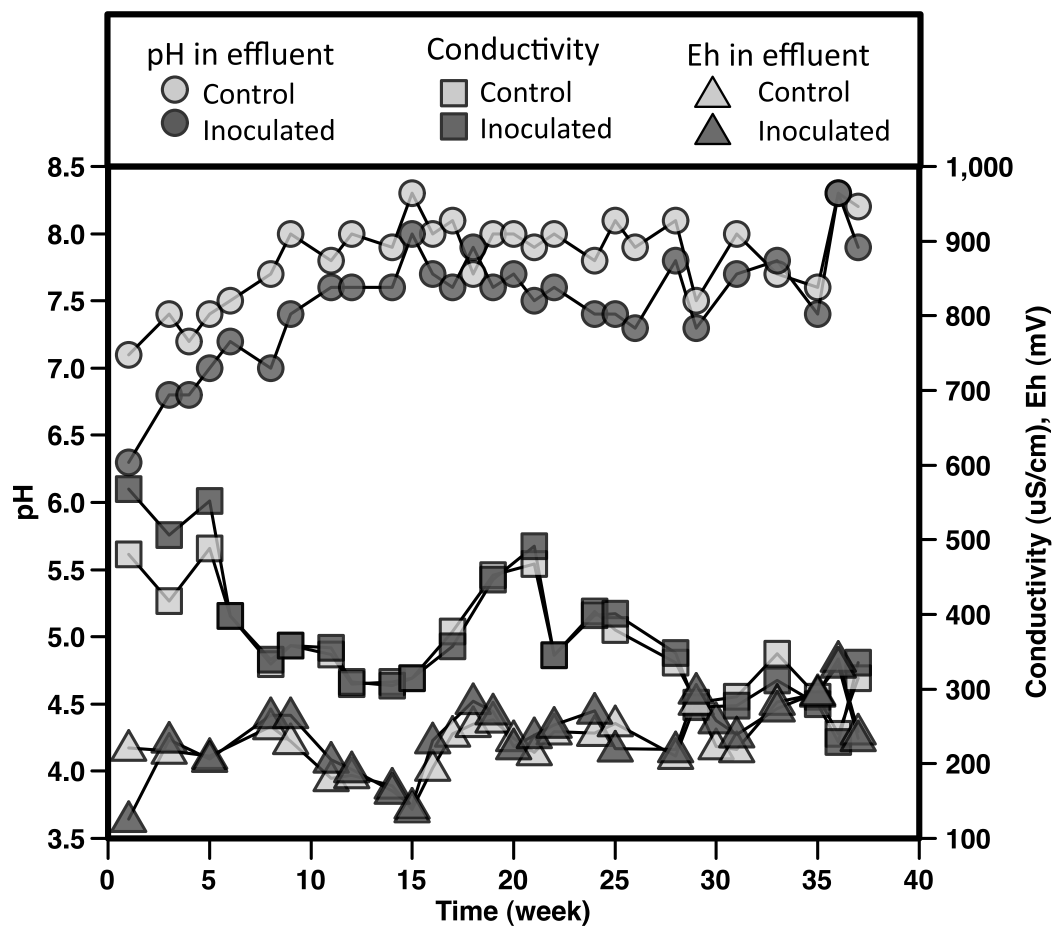



Figure 10: Eh, pH and conductivity in Talbot/Triple 7 large column flow-through effluent over the duration of the experiment.

Concentrations of elements in the soil of the biotic column at the termination of the experiment normalized by those in the control column yielded some elemental enrichment in the biotic column (Figure 11). Most elemental enrichments (5-100 times) are recorded in the 0.1M Hydroxylamine extraction, which by definition targets the soil phase sorbed to Mn-hydroxides, and includes Ag, Al, Co, Cu, Fe, Ni, Pb, V, and Zn; elements depleted include Ca and Mg. Other elemental enrichments occur in the 0.25M Hydroxylamine and HCl extractions, specifically Al, Co, Fe, Mn and Zn.

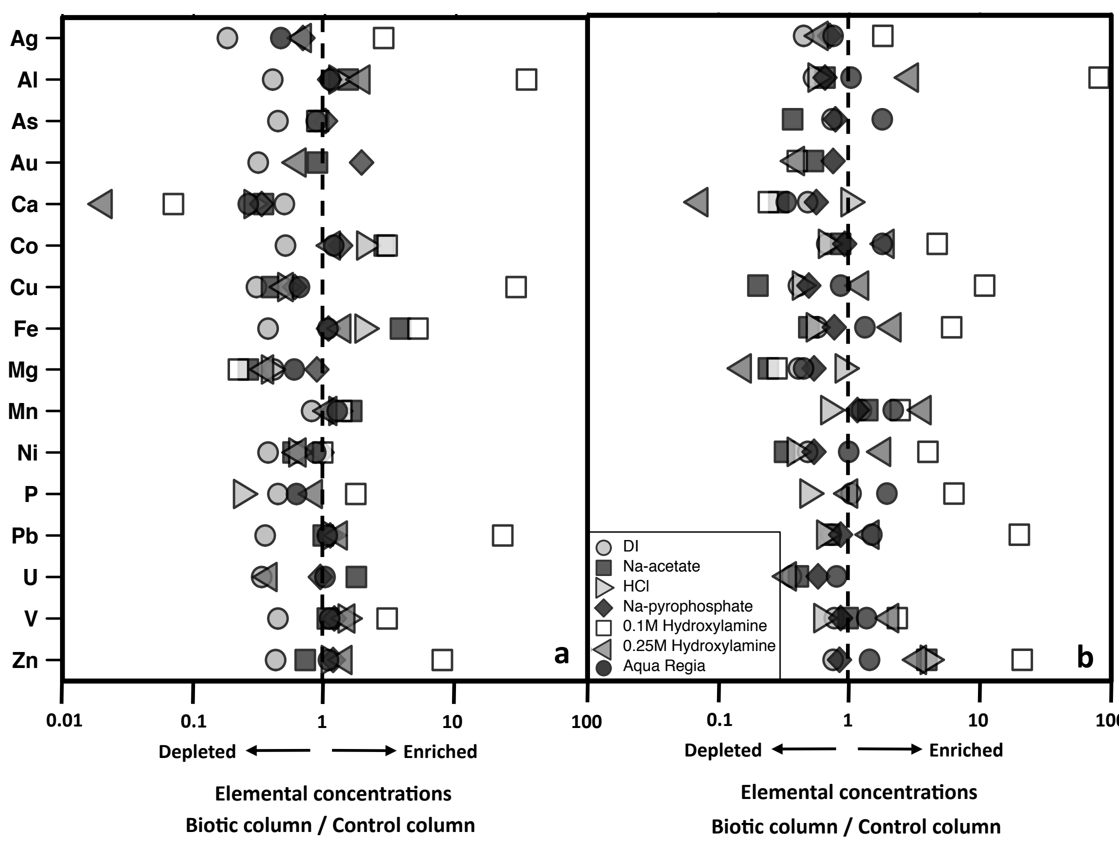



Figure 11: Solid phase extractions on Talbot/Triple 7 large columns a) top of soil profile b) bottom of soil profile. Results are presented as concentration in biotic column normalized by concentration in control column.

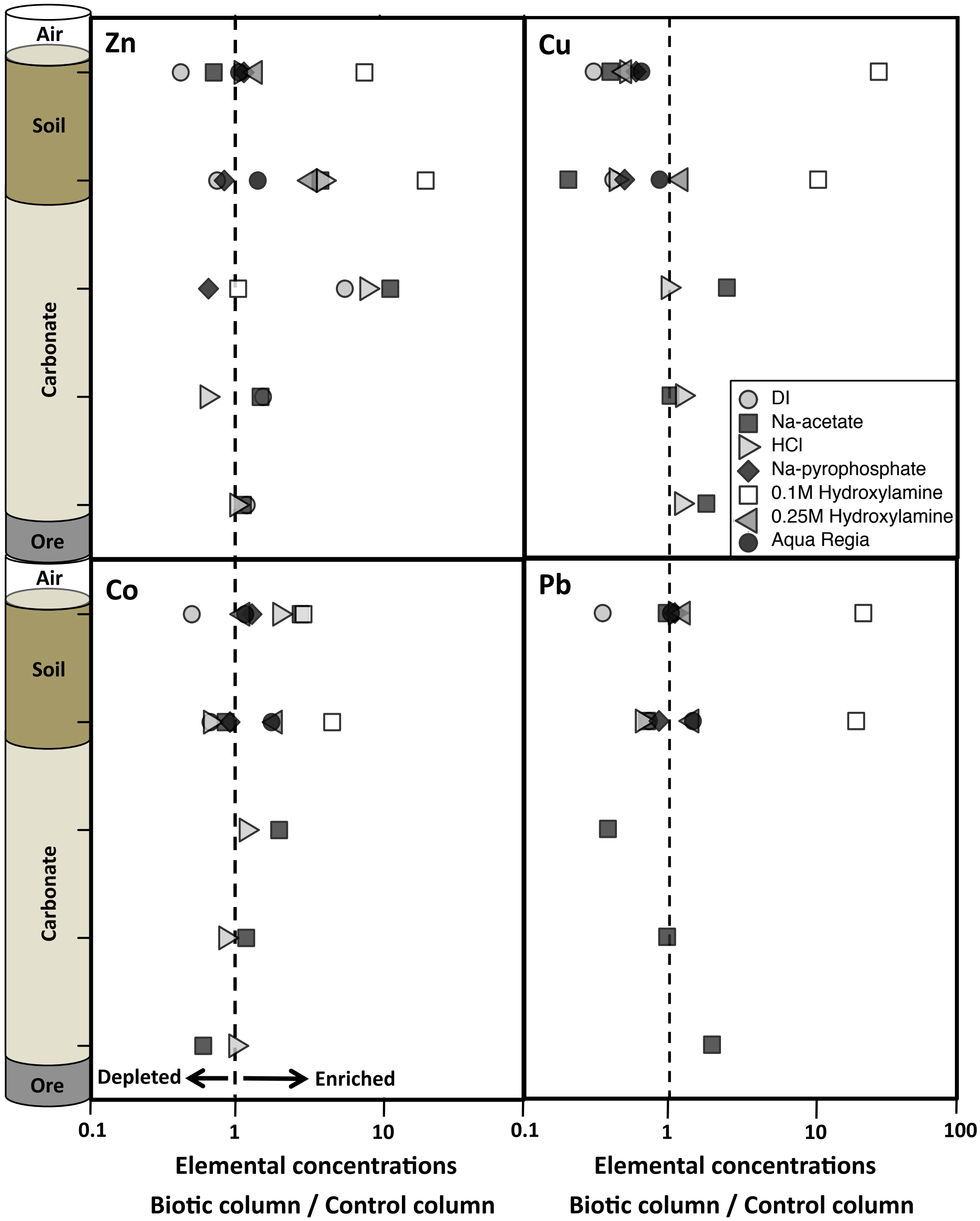



Figure 12: Elemental concentrations (Zn, Cu, Co, and Pb) in solid phase extractions on Talbot/Triple 7 large columns profile. Results are presented as concentration in biotic column normalized by concentration in control column.

Table 2. Elemental ratios (biotic column normalized by control column) for all extractions. Elements that are enriched in the biotic column have a ratio of >1.3 and are highlighted in black. Elements that are depleted have a ratio of <0.7, and are highlighted in light grey. Elements that are unaffected have a ratio of approximately 1.0, and are dark grey.

| | **Large columns** | | | | | | | **Small Columns** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DI | Na acetate | HCl | Na pyro | 0.1M Hyd | 0.25M Hyd | Aqua Regia | DI | Na acetate | HCl | Na pyro | 0.1M Hyd | 0.25M Hyd | Aqua Regia |
| Ag | 0.3 | | | 0.7 | 2.3 | 0.6 | 0.6 | 1.0 | | | | 1.0 | 1.0 | 2.1 |
| Al | 0.5 | 1.1 | 0.9 | 0.9 | 57.8 | 2.3 | 1.1 | 0.9 | 0.9 | 1.3 | 1.1 | 0.9 | 1.0 | 1.0 |
| As | 0.6 | 0.6 | | 0.9 | 0.9 | | 1.3 | 0.9 | | | 1.1 | 1.3 | 0.8 | 1.7 |
| Au | 0.3 | 0.7 | | 1.3 | 0.4 | 0.5 | | | 3.0 | | | 2.6 | 4.8 | 7.2 |
| Ba | 0.4 | 0.7 | 0.4 | 0.8 | 2.4 | 1.2 | 1.0 | 0.9 | 1.0 | 1.0 | 1.2 | 0.9 | 1.0 | 1.0 |
| Be | 0.5 | 1.0 | 0.9 | 0.9 | 7.1 | 1.4 | | 0.8 | | | 1.1 | 1.0 | 1.0 | |
| Br | 0.5 | | | | | | | 1.0 | | | | | | |
| Ca | 0.5 | 0.3 | 0.7 | 0.4 | 0.2 | 0.0 | 0.3 | 0.9 | 1.1 | 1.0 | 1.0 | 1.5 | 1.9 | 1.2 |
| Cd | 0.6 | | 1.3 | 1.1 | | | 1.5 | | | 1.1 | 1.1 | 1.0 | 1.0 | 4.7 |
| Ce | 0.3 | 0.5 | | 0.9 | 53.8 | 1.1 | | 0.9 | 1.1 | | | | | |
| Cl | 0.7 | | | | | | | 0.9 | | | | | | |
| Co | 0.6 | 1.9 | 1.4 | 1.1 | 3.8 | 1.5 | 1.5 | 0.9 | 1.1 | 1.3 | 1.0 | 1.5 | 5.6 | 1.2 |
| Cr | | | 1.1 | | | | 1.1 | | | 1.1 | 1.1 | 0.9 | 1.0 | 1.0 |
| Cs | 0.5 | 2.4 | | 0.9 | | 2.4 | | 0.8 | | | | | | |
| Cu | 0.4 | 0.3 | 0.5 | 0.5 | 19.7 | 0.8 | 0.7 | 0.9 | 1.7 | 1.4 | 1.0 | 1.0 | 1.1 | 3.9 |
| Dy | 0.2 | 0.2 | | 0.5 | 12.9 | 0.4 | | 0.9 | 1.2 | | | | | |
| Er | 0.2 | 0.2 | | 0.5 | 8.2 | 0.4 | | 0.9 | 1.2 | | | | | |
| Eu | 0.2 | 0.2 | | 0.4 | | 0.3 | | 0.8 | 1.1 | | | | | |
| Fe | 0.5 | 2.1 | 1.3 | 0.9 | 5.6 | 1.7 | 1.2 | 0.9 | 1.0 | 1.1 | 1.1 | 0.9 | 1.1 | 1.0 |
| Gd | 0.2 | 0.3 | | 0.5 | 6.2 | 0.2 | | 1.2 | 1.1 | | | | | |
| Hg | 0.3 | 0.2 | | | | | 0.8 | | | | | | | 1.6 |
| K | 0.5 | 1.0 | 0.9 | 0.8 | 2.8 | 1.7 | 1.0 | 0.9 | 1.1 | 1.1 | 1.1 | 1.0 | 1.2 | 0.9 |
| La | 0.2 | 0.2 | | 0.5 | 21.7 | 0.4 | 0.7 | 0.9 | 1.1 | | | | | 0.8 |
| Li | 0.4 | 0.5 | 0.7 | 0.7 | 5.1 | 1.9 | | 0.9 | 0.5 | 1.5 | 1.1 | 1.3 | 1.5 | |
| Mg | 0.4 | 0.3 | 0.7 | 0.7 | 0.3 | 0.2 | 0.5 | 0.9 | 1.1 | 0.9 | 1.0 | 1.5 | 2.0 | 1.2 |
| Mn | 1.0 | 1.5 | 1.0 | 1.2 | 1.9 | 2.3 | 1.7 | 1.0 | 1.1 | 1.1 | 1.2 | 0.9 | 0.8 | 1.2 |
| Mo | 0.9 | | | 1.1 | | | 1.8 | 1.3 | | 0.8 | | 0.8 | 1.0 | 1.1 |
| Na | 0.7 | | 0.8 | | | | 0.9 | 0.9 | | 1.0 | 1.0 | 1.0 | 1.1 | 0.9 |
| Nb | 0.4 | | | 0.9 | | 2.5 | | 0.8 | | | | | | |
| Nd | 0.2 | 0.2 | | 0.4 | 6.5 | 0.4 | | 0.9 | 1.0 | | | | | |
| Ni | 0.4 | 0.4 | 0.5 | 0.7 | 2.5 | 1.2 | 0.9 | 0.9 | 1.0 | 1.0 | 0.9 | 1.0 | 1.1 | 1.0 |
| P | 0.7 | | 0.4 | | 4.0 | 0.9 | 1.3 | 1.0 | | 2.4 | 1.0 | 1.0 | 0.9 | 1.0 |
| Pb | 0.5 | 0.8 | 0.9 | 1.0 | 21.2 | 1.3 | 1.3 | 0.9 | 1.1 | 1.3 | | 0.6 | 0.9 | 0.9 |
| Pr | 0.2 | 0.2 | | 0.4 | 5.9 | 0.4 | | 0.9 | 1.1 | | | | | |
| Rb | 0.6 | 3.0 | | 1.0 | 10.6 | 5.2 | | 0.9 | 1.0 | | | | | |
| S | 0.9 | | 0.7 | | | | 1.0 | 0.7 | | 0.9 | 0.9 | 1.5 | 1.7 | 1.2 |
| Sb | 0.3 | 0.5 | | 0.7 | | | 0.3 | 0.8 | 1.2 | | 2.2 | 1.1 | 1.0 | 1.3 |
| Sc | 0.4 | 1.1 | | 0.8 | | 1.8 | 0.9 | 0.8 | | | | | | 1.0 |
| Se | 0.5 | | | | | | 1.8 | 1.2 | | 0.6 | 1.5 | | | 0.6 |
| Sm | 0.2 | 0.2 | | 0.4 | 4.9 | 0.3 | | 1.0 | 1.0 | | | | | |
| Sn | 0.5 | | | 0.9 | | | | 0.9 | | | | | | |
| Sr | 0.4 | 0.8 | 0.9 | 0.7 | 0.6 | 0.3 | 0.9 | 0.9 | 1.1 | 0.9 | 1.1 | 1.0 | 1.3 | 1.0 |
| Th | 0.3 | 0.6 | | 0.9 | | 0.9 | 0.9 | 0.9 | 1.1 | | | | | 0.9 |
| Ti | 0.5 | | 1.9 | 1.0 | | 1.5 | 1.1 | 0.8 | | 1.3 | 1.1 | 1.2 | 2.1 | 0.9 |
| Tl | 0.4 | 0.8 | | 0.9 | | | 1.0 | 0.9 | 1.0 | | 0.3 | 1.4 | 2.3 | 0.9 |
| U | 0.3 | 1.1 | | 0.7 | | 0.3 | 0.9 | 0.9 | 1.0 | | | | | 1.0 |
| V | 0.6 | 1.0 | 1.1 | 1.0 | 2.7 | 1.7 | 1.2 | 0.9 | | 1.2 | 1.0 | 1.0 | 1.1 | 0.9 |
| Zn | 0.6 | 2.3 | 2.6 | 1.0 | 14.3 | 2.3 | 1.2 | 0.7 | 0.8 | 1.0 | 0.9 | 2.0 | 1.2 | 2.2 |
| Zr | 0.4 | 1.0 | | 0.8 | | 1.7 | | 0.9 | 1.0 | | | | | |

Depth profiles of Zn, Cu, Co, and Pb (Figure 12) show that the largest enrichments occur at the top of the soil profile, and decrease with depth. These metals are most successfully targeted by the 0.1M Hydroxylamine-HCl extraction in the soil zone, and the Na-acetate extraction in the carbonate zone. Extraction-associated elemental concentrations in all column experiments are presented as ratios (Table 2). The elemental concentrations in the biotic column are normalized by the elemental concentrations in the control column, and enriched values are highlighted in black, depleted values in light grey, and unaffected in dark grey.

Isotopic compositions of the column materials are similar except in the soil zone. The $\delta^{13}C$ of the soil zone in the control column was -9‰, while the top and bottom depths of the biotic column were -24‰ and -19‰, respectively. In the carbonate zone $\delta^{13}C = 0‰$ and $\delta^{18}O = 26‰$, and in the ore zone $\delta^{34}S$ was 1‰.

## DISCUSSION

Recent investigations of the distribution of microorganisms throughout the subsurface and their influence on the geochemical environment have documented the presence of geomicrobiological controls on ore weathering and metal mobility, however the geologic settings and microbial ecology investigated have been limited (Southam and Saunders, 2005). This study aims to expand the current knowledge of biogeochemical controls on metal mobility in the subsurface utilizing controlled flow-through column experiments. As the rate of oxidation of sulfides has been documented to increase due to the activity of Fe- and S- oxidizing bacteria (Enders et al., 2006; Southam and Saunders, 2005), a typical sulfur-oxidizing bacteria was used in the column flow-through experiments. An organism was isolated and characterized from the deep subsurface in the Triple 7 mine, Flin Flon, Canada, for use in the column studies, and provided a directly relevant investigation of geomicrobiological control on metal release from ore. As this organism was found to be capable of Fe-oxidation under a variety of conditions (Leslie et al., 2012a), the activity of this organism is expected to increase the alteration rate of sulfides in the column flow-through experiments, as well as the sulfide ore in the subsurface. A mixed culture of organisms, including the isolate and a sulfur-oxidizer, was used in the flow-through column experiments (Table 1). The mixed culture was designed to include all metabolisms likely to be present in the subsurface: Fe oxidation and reduction, S oxidation and reduction, methane genesis and oxidation, nitrate reduction, and heterotrophy under oxic and anoxic conditions.

*Small column ore-only experiments*

Rates of metal release were examined in flow-through column experiments containing the ore only. The concentration of Zn in the effluent of the column inoculated with the Fe-oxidizing isolate only (isolate) was continuously 20-800μmol higher than the control (Figure 4), which demonstrates that the metabolic activity of the isolate does increase the rate of metal release from ore when introduced in monoculture. This result was predicted, as the isolated organism was previously determined to be capable of Fe-oxidation (Leslie et al., 2012a). However, the activity of the sulfur-oxidizer in monoculture (sulfur oxidizer) yielded the highest rate of metal release from ore, maintaining Zn concentrations in the effluent greater than 400μmol for the initial 25 days. When both these organisms were introduced with a mixed culture of organisms (mixed culture), the rate of metal release was lower, with concentrations of Zn never rising higher than 400μmol. This suggests an antagonistic relationship between the organisms, at least in terms of maintaining high aqueous concentrations of Zn, however it should be noted they were still higher than the control. The total Zn release over the 60-day duration of the flow-through experiment from each of the column types is as follows: 1,200μmol from the S-oxidizer column, 500μmol from both the isolate and mixed culture columns, and 90μmol from the control. At the termination of the experiment, the Zn in the effluent of both the isolate and mixed culture columns was still higher than the control, suggesting that the total Zn release from the control column will never exceed the total Zn release from the biotic columns. The lower rate of metal release in the mixed culture, compared to the monoculture columns, could be due to competition for nutrients or element cycling (e.g. redox processes and incongruent dissolution) or the accumulation of toxic metabolic byproducts in the mixed culture column. In the single-organism columns it is possible that toxicity due to the rapid metal release reduced the microbial population (suggestive by the drop off in effluent concentrations), however, this was difficult to constrain as sulfide material interferes with total biomass determination and microscopic direct count. Regardless, the rate of metal release, and possibly also the total metal release, in all biotic columns is significantly higher than the control.

*Small column full profile experiments*

Given the higher rate of metal release in the ore-only biotic columns, it is surprising that there are no differences in metal concentrations in the effluents of the full profile small columns (Figure 5). To determine whether the expected higher metal release in the biotic columns did occur, but was sequestered by the soil zone, selective extractions were completed on the soil (Figure 6). Many elements were enriched in the soil zone including Ag, As, Au, Cd, Co, Cu, P, Ti and Zn and were revealed through the use of aqua regia, 0.5M HCl, and 0.25M Hydroxylamine-HCl extractions. Aqua regia is a conventional near-total extraction that targets the most resistant fraction of the soil, while the other extractions are defined to target elements in the Fe-oxide phase (Cameron et al., 2004). The depth distribution of the main economic metals, Cu and Zn (Figure 7), indicates that the enrichment only occurs in the soil zone of the small columns. This is expected, as the soil contains reactive phases, such as clay minerals, organic matter and Fe-, Mn-oxides known to scavenge metals (van Geffen et al., 2012). The added biomass of the mixed culture in the biotic column is present in the mid-carbonate phase (Figure 7), however, as the material used in the columns was not sterilized, the natural microbial biomass present in the soil zone could have masked any of the mixed culture population in the soil. The $\delta^{13}C$ of the soil zone (-11‰) in the biotic columns is more negative than the controls (-5‰), which developed due to the enhanced microbial activity of the mixed culture. A wide range of microbial metabolisms (e.g. methanogenesis, methanotrophy, heterotrophy) could have created the depleted signal in either precipitated carbonates or organic carbon generated in the soil zone. While the exact metabolism and location of the enhanced microbial activity within the biotic columns is not known, microbial activity must have caused the low $\delta^{13}C$ and enhanced soil metal anomalies in the small column flow-through experiments.

*Large column full profile experiments*

The same flow through experiment was completed in large columns, and the results differed from those of the small columns. Concentrations of Si, Fe, Mn and S were higher in the biotic column effluent compared to the control (Figure 8). There was also a significant difference in concentrations of Zn in the effluent, with Zn concentrations in the biotic column approximately 0.5μmol higher than the control. After 20 weeks, Zn concentrations in the effluent of the columns became equivalent, however after a second inoculation of the mixed culture at 25 weeks, Zn concentration in the biotic column effluent again increased by 0.5μmol, indicating that Zn was clearly mobilized by the microbial activity. No other elements demonstrated the same increase after the secondary inoculation; this is possibly due to the bioactivity and relatively low toxicity of Zn, compared to the other major elements present in the ore (Cameron et al., 2004; Gough et al., 2008; Hassen, 1998). In addition, many elements such as Cu readily preferentially sorb to surfaces and are incorporated and sequestered in secondary mineral phases, whereas Zn is typically considered highly mobile (Cameron et al., 2004; Hassen, 1998).

The higher concentration of metals (0.5μmol Zn, 100μmol Si, 1μmol Fe, and 20-100μmol Mn) in the effluent of the biotic column compared with the control demonstrates that the presence of the mixed culture enhances the rate of metal release, and therefore, the extent of metal mobility in the flow-through column experiments. This is in contrast with the smaller column experiments (Figure 5), where the mixed culture had minimal effect on metal effluent content. Selective extractions on the soil zone of the large columns (Figure 11) indicate elements such as Ag, Al, Co, Cu, Fe, Pb and Zn are 10-100 times more enriched in the biotic column relative to the control using the 0.1M Hydroxylamine-HCl extraction. This protocol has been demonstrated to target elements absorbed to Mn-oxides, a very reactive phase in soil (Bajc, 1998) which suggests these elements may be associated with these phases or similar mineral surfaces. Other elemental enrichments in the soil zone of the biotic column include Al, Co, Fe, Mn and Zn in the 0.25M Hydroxylamine-HCl, Na-acetate, and 0.5M HCl extractions. The 0.25M Hydroxylamine-HCl and 0.5M HCl extractions target elements absorbed to Fe-oxides, and the Na-acetate and 0.5M HCl extractions target carbonate-associated elements. However, organic matter present in the soil of the biotic column, which is targeted by the Na-pyrophosphate extraction (Hall, 1996), did not result in element concentrations greater than the control. Organic matter, clay minerals, and Fe-, Mn-oxides have high surface areas, and therefore have tremendous metal scavenging ability (Bajc, 1998; Cameron et al., 2004; Kelley et al., 2006; Southam and Saunders, 2005). Selective extractions in depth profile show that there are elemental enrichments in the carbonate phase, specifically at the soil-carbonate boundary (Figure 12). Some elements, for example Cu, Mn, Fe, and Zn, should be absorbed and co-precipitated by carbonate.

*Summary of column experiments*

The positive elemental anomalies, when compared to controls in the soil zone of the biotic columns, both in the large and small full profile columns (Table 2), are consistent with enhanced metal mobility from the lower profile. It is clear that the primary driver of this phenomenon is microbial activity, and subsequent sequestration of these elements by reactive phases in the soil zone. We use a deionised water leach to represent the highly reactive bio-accessible elemental component of the soil (Garrett, 2009), and elemental depletions occurred in the deionised water extraction of the large column only. By contrast, in the small columns there was not a depletion of elements in the deionised water extraction, and this is suggestive of a progression towards a more inert phase that is sequestering these elements due to exposure to more pore volumes of fluid and will be discussed further below. Similarly, pathfinder elements, such as Ag, Al, Ce, Co, Cu, Dy, Er, Gc, La, Nd, Pr, Rb, Pb and Zn that were extremely enriched in the reactive Mn-oxide phase of the large column were only enriched in the aqua regia extractions of the small columns. The differences in element concentrations in the effluents and solid phase extractions of the large and small columns are likely due to the differences in the amount of material used and relative to the duration in each experiment. The large columns contained approximately 60 times more total material by volume than the small columns. Therefore, for the duration of the experiments to be comparable between the large and small columns, large columns would have to be run for at least 7 years longer. This relative difference in reaction time may have led to the development of less reactive mineral phases in the small columns through recrystallization and/or passivation of surfaces.

The difference in amount of material used suggests that the large column flow-through experiment may be a more representative model of the geologic setting, specifically in terms of the amount of material available for reaction and distance of transport. However, both the small and large column experiments are not completely representative of the natural environment because the experiments were carried out under saturated conditions, with unidirectional upward flow. The water/rock ratio in the columns was approximately 0.5, which is higher than would be encountered in the natural environment, although this artificial enhancement of reactivity was required to increase the rate of reaction and decrease the duration of the experiment. It should be noted however that because of these difference we were provided with different temporal snapshots of the biogeochemical reactions ongoing in these profiles.

To evaluate these results with respect to the geologic setting, the concentration of elements in the solid phase extractions are compared to the geochemical survey of the Talbot prospect (van Geffen et al., 2012) and the concentration of elements in the effluent are compared to the aqueous geochemistry of the water in the subsurface at Triple 7 mine (Leslie et al., 2012a). The concentration of Zn in the soil zone of the large biotic column was 300ppb, 15ppm and 70ppm for the DI, 0.1M Hydroxylamine-HCl, and aqua regia extractions, respectively. The same extractions at the anomalous locations at the Talbot prospect have Zn concentrations of 50ppb, 70ppm, and 200ppm, respectively (van

Geffen et al., 2012). The concentrations of Zn in the biotic column and the field soil anomaly are comparable, however, the Zn contents in the biotic column were slightly lower in the stronger extractions and slightly higher in the weaker extractions. This suggests that with more time, elements in the biotic large column would be sequestered in more resistant phases, which is corroborated by the results of our smaller profile columns. Water collected from Triple 7 mine (Leslie et al., 2012a) consisted of dissolved Mn (470μM), Fe (20μM), and Zn (3μM). These concentrations are similar to the large column effluent concentrations of Mn (10-120μM), Fe (1-2μM), and Zn (0.5-2μM) (Figure 8) suggesting that while the flow-through design was artificially enhanced, the elemental fluxes are realistic when compared to values from the field.

## CONCLUSION

Flow-through experiments with ore from Triple 7 Cu-Zn VMS mine demonstrate that the presence and activity of microorganisms increases the rate of alteration and metal release. Flow-through experiments with ore, overburden and soil demonstrate that the presence and activity of microorganisms increases the rate of soil metal anomaly development in reactive Fe- and Mn-oxide phases, relative to un-inoculated control columns. Comparison of metal fluxes in the columns to the Talbot field site demonstrates that the flow-through experiments were a reasonable representation of the operative processes in the field. Although there are still unanswered questions regarding the specific biogeochemical processes active and their individual relative importance on mobilization of metals from ore deposits, it is now clear that the presence and activity of microorganisms significantly increases the rate of metal release from ore at depth, the subsequent sequestration near the surface, and are a critical component for metal cycling in these systems.

REFERENCES

Alpers, C.N., Dettman, D.L., Lohmann, K.C., and Brabec, D., 1990, Stable isotopes of carbon-dioxide in soil gas over massive sulfide mineralization at Crandon, Wisconsin Journal of Geochemical Exploration, v. 38, p. 69-86.

Anand, R.R., Cornelius, M., and Phang, C., 2007, Use of vegetation and soil in mineral exploration in areas of transported overburden, Yilgarn Cration, Western Australia: a contribution towards understanding metal transportation processes: Geochemistry-Exploration Environment Analysis, v. 7, p. 267-288.

Bajc, A.F., 1998, A comparative analysis of enzyme leach and mobile metal ion selective extractions; case studies from glaciated terrain, northern Ontario: Journal of Geochemical Exploration, v. 61, p. 113-148.

Bawden, T.M., Einaudi, M.T., Bostick, B.C., Meibom, A., Wooden, J., Norby, J.W., Orobona, M.J.T., and Chamberlain, C.P., 2003, Extreme S-34 depletions in ZnS at the Mike gold deposit, Carlin Trend, Nevada: Evidence for bacteriogenic supergene sphalerite: Geology, v. 31, p. 913-916.

Cameron, E.M., Hamilton, S.M., Leybourne, M.I., Hall, G.E.M., and McClenaghan, M.B., 2004, Finding deeply buried deposits using geochemistry: Geochemistry-Exploration Environment Analysis, v. 4, p. 7-32.

Enders, M.S., Knickerbocker, C., Titley, S.R., and Southam, G., 2006, The role of bacteria in the supergene environment of the Morenci Porphyry Copper Deposit, Greenlee County, Arizona: Economic Geology, v. 101, p. 59-70.

Ferris, F.G., Fyfe, W.S., and Beveridge, T.J., 1987, Bacteria as nucleation sites for authigenic minerals in a metal-contaminated lake sediment Chemical Geology, v. 63, p. 225-232.

Findlay, R.H., King, G.M., and Watling, L., 1989, Efficacy of phospholipid analysis in determining microbial biomass in sediments Applied and Environmental Microbiology, v. 55, p. 2888-2893.

Fu, C.C., Yang, T.F., Walia, V., and Chen, C.H., 2005, Reconnaissance of soil gas composition over the buried fault and fracture zone in southern Taiwan: Geochemical Journal, v. 39, p. 427-439.

Gao, Y., Wang, M., and Zhang, D.-e., 2011, Application of 'metals-in-soil-gas' techniques to mineral exploration in exotic overburden: Geochemistry-Exploration Environment Analysis, v. 11, p. 63-70.

Garrett, R.G., Hall, G.E.M., Vaive, J.E., and Pelchat, P., 2009, A water-leach procedure for estimating bioaccessibility of elements in soils from transects across the United States and Canada: Applied Geochemistry, v. 24, p. 1438-1453.

Gilliss, M.L., Al, T.A., Blowes, D.W., Hall, G.E.M., and MacLean, B., 2004, Geochemical dispersion in groundwater from a weathered Cu-Zn deposit in glaciated terrain: Geochemistry-Exploration Environment Analysis, v. 4, p. 291-305.

Gough, H.L., Dahl, A.L., Nolan, M.A., Gaillard, J.-F., and Stahl, D.A., 2008, Metal impacts on microbial biomass in the anoxic sediments of a contaminated lake: Journal of Geophysical Research-Biogeosciences, v. 113.

Hall, G.E.M., Vaive, J.E., and MacLaurin, A.I., 1996, Analytical aspects of the application of sodium pyrophosphate reagent in the specific extraction of the labile organic component of humus and soils: Journal of Geochemical Exploration, v. 56, p. 23-36.

Hamilton, S.M., Cameron, E.M., McClenaghan, M.B., and Hall, G.E.M., 2004a, Redox, pH and SP variation over mineralization in thick glacial overburden. Part I: methodologies and field investigation at the Marsh Zone gold property: Geochemistry-Exploration Environment Analysis, v. 4, p. 33-44.

—, 2004b, Redox, pH and SP variation over mineralization in thick glacial overburden. Part II: field investigation at Cross Lake VMS property: Geochemistry-Exploration Environment Analysis, v. 4, p. 45-58.

Hassen, A., Saidi, N., Cherif, M., and Boudabous, A., 1998, Resistance of environmental bacteria to heavy metals: Bioresource Technology, v. 64, p. 7-15.

Hausrath, E.M., Liermann, L.J., House, C.H., Ferry, J.G., and Brantley, S.L., 2007, The effect of methanogen growth on mineral substrates: will Ni markers of methanogen-based communities be detectable in the rock record?: Geobiology, v. 5, p. 49-61.

Heiri, O., Lotter, A.F., and Lemcke, G., 2001, Loss on ignition as a method for estimating organic and carbonate content in sediments: reproducibility and comparability of results: Journal of Paleolimnology, v. 25, p. 101-110.

Kelley, D.L., Kelley, K.D., Coker, W.B., Caughlin, B., and Doherty, M.E., 2006, Beyond the obvious limits of ore deposits: The use of mineralogical, geochemical, and biological features for the remote detection of mineralization: Economic Geology, v. 101, p. 729-752.

Kulczycki, E., Fowle, D.A., Knapp, C., Graham, D.W., and Roberts, J.A., 2007, Methanobactin-promoted dissolution of Cu-substituted borosilicate glass: Geobiology, v. 5, p. 251-263.

Leslie, K., Sturm, A., Stotler, R.L., Oates, C.J., Kyser, T.K., and Fowle, D.A., 2012a, Isolated Fe(II)-oxidizing Marinobacter associated with a massive sulfide ore deposit affects metal mobility in the deep subsurface: Manuscript submitted for publication.

Leslie, K., van Geffen, P., Macfarlane, B., Oates, C.J., Kyser, T.K., and Fowle, D.A., 2012b, Biogeochemical indicators of buried mineralization under cover, Talbot prospect, Manitoba: Manuscript submitted for publication.

Lollar, B.S., Lacrampe-Couloume, G., Slater, G.F., Ward, J., Moser, D.P., Gihring, T.M., Lin, L.H., and Onstott, T.C., 2006, Unravelling abiogenic and biogenic sources of methane in the Earth's deep subsurface: Chemical Geology, v. 226, p. 328-339.

Malmqvist, L., Kristiansson, K., and Kristiansson, P., 1999, Geogas prospecting - an ideal industrial application of PIXE: Nuclear Instruments & Methods in Physics Research Section B-Beam Interactions with Materials and Atoms, v. 150, p. 484-490.

Melchior, A., Dejonghe, L., and Hughes, G., 1996, A geomicrobiological study of soils collected from auriferous areas of Argentina: Journal of Geochemical Exploration, v. 56, p. 219-227.

Mielke, R.E., Pace, D.L., Porter, T., and Southam, G., 2003, A critical stage in the formation of acid mine drainage: Colonization of pyrite by Acidithiobacillus ferrooxidans under pH-neutral conditions: Geobiology, v. 1, p. 81-90.

Parduhn, N.L., 1991, A microbial method of mineral exploration - A case-history at the Mesquite deposit Journal of Geochemical Exploration, v. 41, p. 137-149.

Polito, P., Kyser, K., Lawie, D., Cook, S., and Oates, C., 2007, Application of sulphur isotopes to discriminate Cu-ZnVHMS mineralization from barren Fe sulphide mineralization in the greenschist to granulite facies Flin Flon-Snow Lake-Hargrave River region, Manitoba, Canada: Geochemistry-Exploration Environment Analysis, v. 7, p. 129-138.

Reith, F., and McPhail, D.C., 2007, Mobility and microbially mediated mobilization of gold and arsenic in soils from two gold mines in semi-arid and tropical Australia: Geochimica Et Cosmochimica Acta, v. 71, p. 1183-1196.

Reith, F., McPhail, D.C., and Christy, A.G., 2005, Bacillus cereus, gold and associated elements in soil and other regolith samples from Tomakin Park Gold Mine in southeastern New South Wales, Australia: Journal of Geochemical Exploration, v. 85, p. 81-98.

Reith, F., and Rogers, S.L., 2008, Assessment of bacterial communities in auriferous and non-auriferous soils using genetic and functional fingerprinting: Geomicrobiology Journal, v. 25, p. 203-215.

Rogers, J.R., and Bennett, P.C., 2004, Mineral stimulation of subsurface microorganisms: release of limiting nutrients from silicates: Chemical Geology, v. 203, p. 91-108.

Rogers, J.R., Bennett, P.C., and Choi, W.J., 1998, Feldspars as a source of nutrients for microorganisms: American Mineralogist, v. 83, p. 1532-1540.

Sillitoe, R.H., Folk, R.L., and Saric, N., 1996, Bacteria as mediators of copper sulfide enrichment during weathering: Science, v. 272, p. 1153-1155.

Simonetti, A., Bell, K., and Hall, G.E.M., 1996, Pb isotopic ratios and elemental abundances for selective leachates from near-surface till: Implications for mineral exploration: Applied Geochemistry, v. 11, p. 721-734.

Smee, B.W., 1998, A new theory to explain the formation of soil geochemical responses over deeply covered gold mineralization in arid environments: Journal of Geochemical Exploration, v. 61, p. 149-172.

Southam, G., and Saunders, J.A., 2005, The geomicrobiology of ore deposits: Economic Geology, v. 100, p. 1067-1084.

Sturm, A., Crowe, S.A., and Fowle, D.A., 2008, Trace lead impacts biomineralization pathways during bacterial iron reduction: Chemical Geology, v. 249, p. 282-293.

Townley, B., Puig, A., Ojeda, G., Luca, R., Vargas, T., and LeRoux, J., 2007, Understanding real time processes behind the development of surface geochemical expressions from ore bodies beneath cover: source to surface and detection by means of collector devices, *in* Milkereit, B., ed., Proceedings of Exploration 07; Fifth Decennial International Conference on Mineral Exploration, p. 1019-1021.

van Geffen, P.W.G., Kyser, T.K., Oates, C.J., and Ihlenfeld, C., 2012, Till and vegetation geochemistry at the Talbot VMS Cu-Zn prospect, Manitoba, Canada:

implications for mineral exploration: Geochemistry-Exploration Environment Analysis, v. 12, p. 67-86.

Wakelin, S., Anand, R.R., Macfarlane, C., Reith, F., Noble, R., and Rogers, S., 2012, Assessing microbiological surface expression over an overburden-covered VMS deposit: Journal of Geochemical Exploration, v. 112, p. 262-271.

White, D.C., Davis, W.M., Nickels, J.S., King, J.D., and Bobbie, R.J., 1979, Determination of the sedimentary microbial biomass by extractable lipid phosphate Oecologia, v. 40, p. 51-62.

# CHAPTER 5. BIOGEOCHEMICAL CONTROLS ON METAL MOBILITY: MODELING A CU-PORPHYRY DEPOSIT IN COLUMN FLOW-THROUGH STUDIES

Submitted as separate article:
Leslie, K., Oates, C.J., Kyser, T.K., and Fowle, D.A. (2012) Copper mobility: utilizing flow-through column studies to examine methanotrophic controls within a Cu-porphyry deposit. Manuscript formatted for submission at Geobiology

ABSTRACT

The biogeochemical controls on Cu mobility in the subsurface were examined by modeling a Cu-porphyry deposit in flow-through column experiments with varying combinations of introduced microorganisms. The metal content of the column effluents was monitored over the duration of the experiment, and metal content in the soil and gravel overburden was quantified using selective extractions at the termination of the experiments. It was found that the highest rate and amount of copper release from ore and subsequent sequestration in the soil zone occurred due to the presence of a mixed culture, containing a S-oxidizer, sulfate-reducer, Fe-oxidizer, Fe-reducer, methanogen, methanotroph, and heterotroph. The same culture without the methanotroph did not result in the same Cu mobility. These results demonstrate the importance of methanotroph activity in the cycling of Cu in the natural environment, as well as the usefulness of methanotroph abundance in delineating buried Cu-containing mineral deposits.

# INTRODUCTION

Biogeochemical processes have been implicated in the formation and weathering of supergene Cu deposits (Enders et al., 2006; Southam and Saunders, 2005). The organisms that have been specifically implicated in the oxidation process and development of thin supergene metal enrichment blankets are sulfur- and iron-oxidizing bacteria (Southam and Saunders, 2005; Titley, 1975) and sulfate-reducing bacteria (Bawden et al., 2003; Enders et al., 2006), respectively. Isotopic anomalies attributed to the incorporation of microbial organic matter have been documented at several supergene Cu deposits (Melchior et al., 1996; Nelson et al., 2007; Nelson et al., 2009).

While rapid rates of sulfide oxidation and subsequent Cu release due to the activity of iron- and sulfur- oxidizing bacteria in the economic mineral environment have been documented, (Enders et al., 2006; Melchior et al., 1996; Mielke et al., 2003; Sillitoe et al., 1996; Southam and Saunders, 2005; Titley, 1975), other organisms can contribute to weathering and metal release. Microorganisms can directly extract required nutrients from the solid phase, which subsequently results in the dissolution of the mineral structure and release of elements (Rogers and Bennett, 2004; Rogers et al., 1998). Some organisms use this ability to target elements that are specifically required for enzymatic or metabolic processes. The methanotroph requirement for Cu has been documented in controlled studies (Balasubramanian et al., 2012; Fru et al., 2011; Kenney and Rosenzweig, 2012; Knapp et al., 2007; Kulczycki et al., 2011), but lacks definite field observations (Fru, 2011; Fru et al., 2011; Leslie et al., 2012). Methanotrophs require Cu to regulate the activity of methane monooxygenase enzymes, and many produce a Cu chelator, methanobactin, to scavenge Cu from the environment, particularly from insoluble sources (Balasubramanian et al., 2012; Kenney and Rosenzweig, 2012).

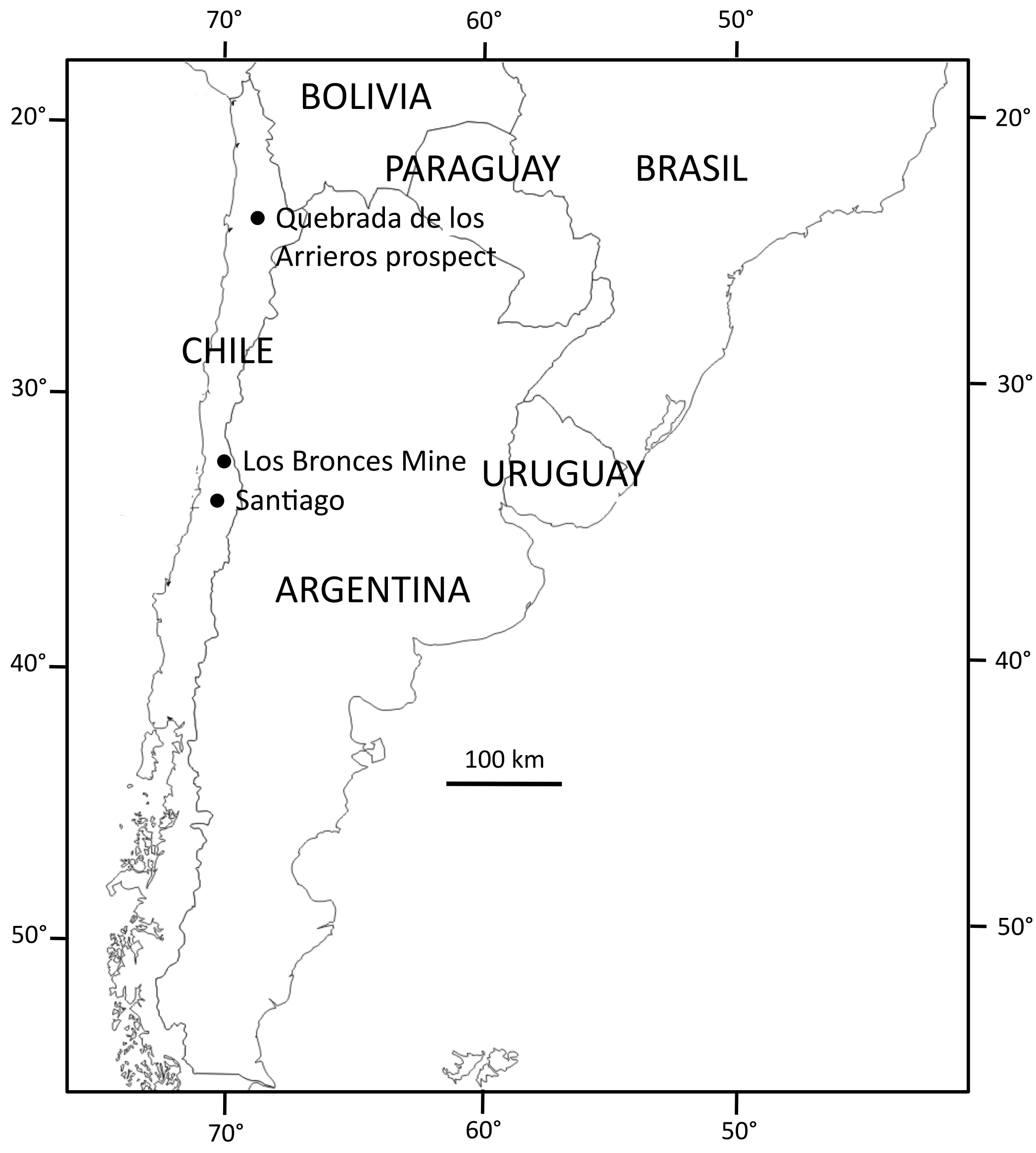



Figure 1: Location map of Los Bronces mine and Quebrada de los Arrieros prospect, Chile.

The purpose of the present research is to investigate the geomicrobiological controls on metal mobility in a supergene Cu porphyry environment, to aid in the exploration for deeply buried deposits. Ore material was collected from the Los Bronces mine, while surface gravels and soils were collected from the Quebrada los Arierros prospect (Figure 1). This material was used to model the Cu-porphyry deposit with overlying gypsum-rich desert gravel and soil overburden in flow-through columns, while introducing controlled microbial cultures. While experiments of this type have been previously completed, and microbial growth was visibly detected, the types of organisms were not identified (Townley et al., 2007). This study aims to delineate specific microbial-metal interactions, and their control on metal mobility and surficial sequestration.

## METHODS

The column flow-through experiments were completed in three separate experiments: ore-only small (5 x 15cm) flow-through columns (Figure 2), full profile small (5 x 15cm) flow-through columns (Figure 2) and large (15 x 90 cm) flow-through columns (Figure 3). The influent for all experiments was at the base of the columns, and consisted of deionized water augmented with NaCl (0.4 mmol), $CaCl_2$ (0.2 mmol), $NaHCO_3$ (0.2 mmol), $MgCl_2$ (0.1 mmol), $K_2SO_4$ (0.1 mmol) and various organic carbon sources, including pyruvate, lactate and acetate (0.1 mmol) (Appendix D). The small column experiments had a flow-through rate of approximately 10mL/day, and the large columns approximately 100mL/day. The ore and soil was crushed and sieved to <250μm, while the gravel was sieved to between 250μm and 6mm. All of the columns were cleaned with HCl and the fittings were autoclaved before the initiation of the flow-through experiments. The columns were dry-packed; after flow was initiated the columns were allowed to flow for several weeks to sufficiently remove air and surface contaminants prior to inoculation.

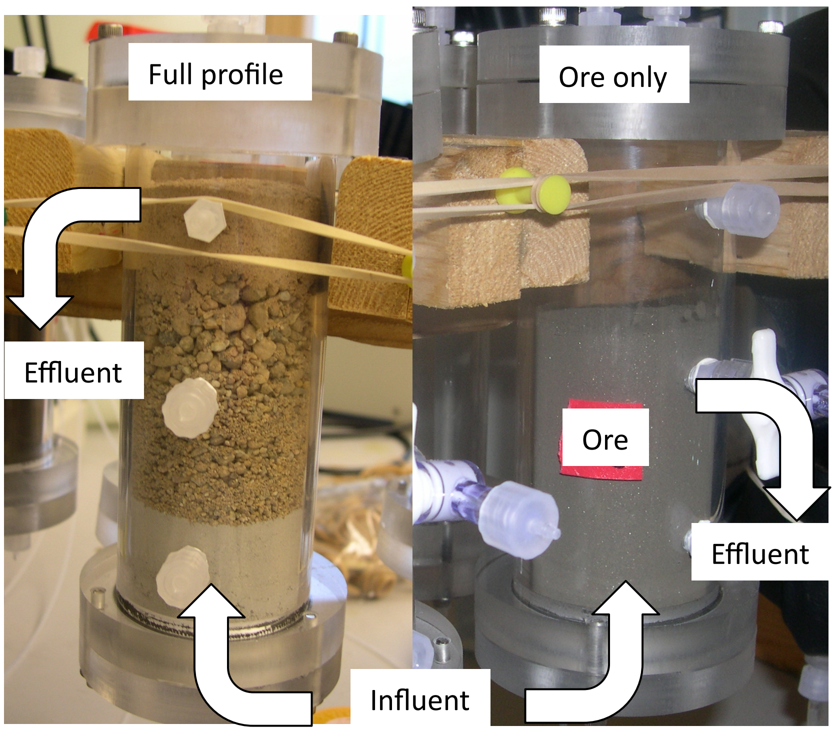



Figure 2: Small column full profile and ore-only experimental set-up for Arrieros/Los Bronces flow-through columns. Influent and effluent ports are labeled.

The organisms used in the inoculations are listed as follows: small ore-only columns (Table 1), small full profile columns (Table 2), and the large full-profile columns (Table 3). Prior to inoculation the cultures were washed five times with DI and concentrated by centrifugation. The effluent was collected from the highest side port; filtered with 0.45 mm syringe filters and acidified to 2% with Trace Metal Grade nitric acid. Samples were diluted to 10 and 100 times and analyzed by ICP-OES (Perkin Elmer Optima 5300DV). Aliquots for anions were collected, filtered, and analyzed at ACME Analytical Laboratories (Vancouver, Canada). The large column effluent was monitored bi-weekly for changes in pH, Eh and conductivity, using Microelectrodes Inc (New Hampshire, USA) flow-through probes and eDAQ (Denistone, Australia) e-corder and quad-stat.

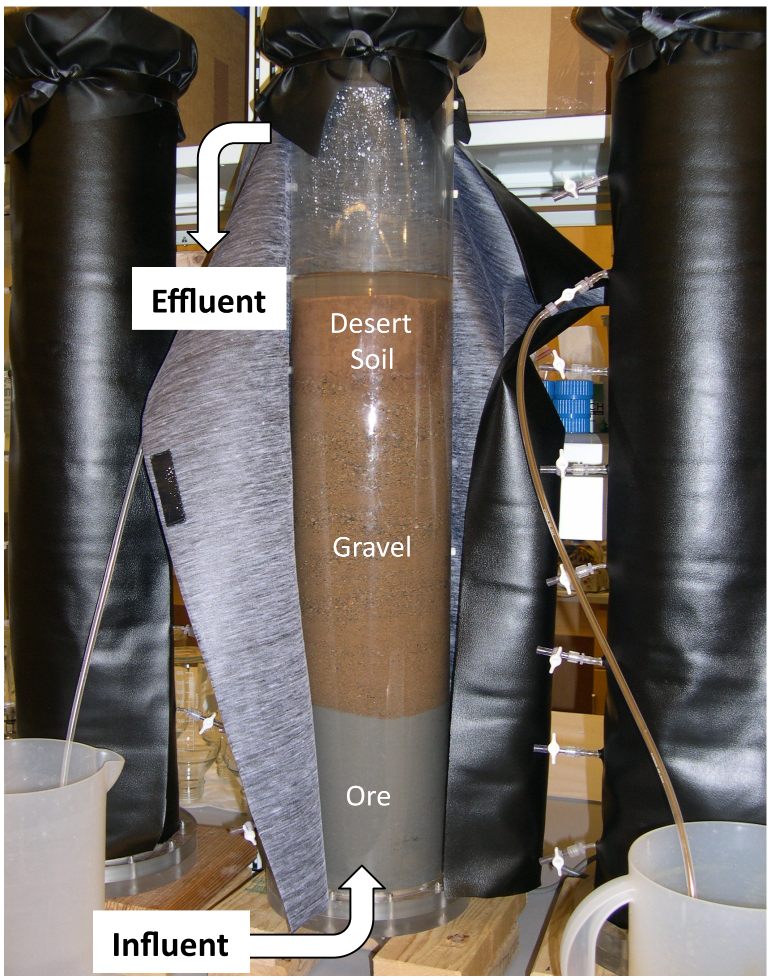



Figure 3: Large column experimental set-up for Arrieros/Los Bronces. Influent and effluent ports are labeled.

Table 1. Inoculation design for ore-only small column flow-through experiments

| Inoculation | Metabolism | Organism name |
|---|---|---|
| Mixed culture | S-oxidizer | *Acidithiobacillus thiooxidans (ATCC 19377)* |
| | Fe-oxidizer Heterotroph | *Marinobacter sp.* |
| | S-, Fe-oxidizer | *Acidithiobacillus ferrooxidans (ATCC 13598)* |
| | Fe-reducer | *Geobacter metallireducens (ATCC 53774)* |
| | S-reducer | *Desulfovibrio desulfuricans (ATCC 13541)* |
| | Methanogen | *Methanobacterium formicicum (ATCC 33274)* |
| S-oxidizer only | S-oxidizer | *Acidithiobacillus thiooxidans (ATCC 19377)* |
| Methanotroph only | Methanotroph | *Methylococcus capsulatus (ATCC 19069), Methylosinus trichosporium(ATCC 49242)* |

Table 2. Inoculation design for full profile small column flow-through experiments

| Inoculation | Metabolism | Organism name |
|---|---|---|
| Mixed culture | S-oxidizer | *Acidithiobacillus thiooxidans (ATCC 19377)* |
| | Fe-oxidizer/ Heterotroph | *Marinobacter* isolate |
| | S-, Fe-oxidizer | *Acidithiobacillus ferrooxidans (ATCC 13598)* |
| | Fe-reducer | *Geobacter metallireducens (ATCC 53774)* |
| | S-reducer | *Desulfovibrio desulfuricans (ATCC 13541)* |
| | Methanogen | *Methanobacterium formicicum (ATCC 33274)* |
| Mixed culture w/methanotroph | S-oxidizer | *Acidithiobacillus thiooxidans (ATCC 19377)* |
| | Fe-oxidizer/ Heterotroph | *Marinobacter* isolate |
| | S-, Fe-oxidizer | *Acidithiobacillus ferrooxidans (ATCC 13598)* |
| | Fe-reducer | *Geobacter metallireducens (ATCC 53774)* |
| | S-reducer | *Desulfovibrio desulfuricans (ATCC 13541)* |
| | Methanogen | *Methanobacterium formicicum (ATCC 33274)* |
| | Methanotroph | *Methylococcus capsulatus (ATCC 19069), Methylosinus trichosporium(ATCC 49242)* |
| S-oxidizer only | S-oxidizer | *Acidithiobacillus thiooxidans (ATCC 19377)* |
| Methanotroph only | Methanotroph | *Methylococcus capsulatus (ATCC 19069), Methylosinus trichosporium(ATCC 49242)* |

Table 3. Inoculation design for full profile large column flow-through experiments

| **Organism metabolism** | **Organism name** |
|---|---|
| S-oxidizer | *Acidithiobacillus thiooxidans (ATCC 19377)* |
| Fe-oxidizer/Heterotroph | *Marinobacter* isolate |
| S-, Fe-oxidizer | *Acidithiobacillus ferrooxidans (ATCC 13598)* |
| Fe-reducer | *Geobacter metallireducens (ATCC 53774)* |
| S-reducer | *Desulfovibrio desulfuricans (ATCC 13541)* |
| Methanotroph | *Methylococcus capsulatus (ATCC 19069),* *Methylosinus trichosporium(ATCC 49242)* |
| Methanogen | *Methanobacterium formicicum (ATCC 33274)* |

The small column flow-through experiments were terminated after 2 months, and the large column flow-through experiments after 7 months. The columns were broken down, and the fill material was separated by depth and material type using sterile methods, freeze-dried, and stored at -80°C. Samples were sent to ACME Analytical Laboratories (Vancouver, Canada) for the following sequential extractions: demineralized water leach for extracting the water-soluble component, 1M ammonium acetate leach for exchangeable cations adsorbed by clay and elements co-precipitated with carbonate, 0.1M sodium pyrophosphate leach for elements adsorbed by organic matter (humic and fulvic compounds), 0.1 M hydroxylamine leach for elements adsorbed by amorphous Mn hydroxide, often the most reactive soil phase for scavenging mobile elements, 0.25 M hydroxylamine leach for elements adsorbed by amorphous Fe hydroxide and more crystalline Mn hydroxide, and aqua regia for complete digestion. A 1M HCl extraction was also completed at KU, and analyzed by ICP-OES.

Organic matter content was determined on the soil zone of all columns by the loss on ignition method (Heiri et al., 2001). Briefly, dried samples were weighed into crucibles and heated to 550°C for a 4-hour duration. Cooled samples were re-weighed; the weight difference is used to calculate the soil organic matter content. Total Biomass was determined on all soil and gravel zones in duplicate. Briefly, 5-10 g of soil was weighed and lipids were extracted with a single-phase chloroform-methanol-buffer (1:2:1 v/v/v) (White et al., 1979). Phosphate was liberated by potassium persulfate digestion in sealed ampoules at 95°C overnight. Phosphate concentrations were determined spectrophotometrically after the addition of ammonium molybdate and malachite green (Findlay et al., 1989). This method has an analytical error of 5%, with a detection limit of $10^4$cells/gram soil.

## RESULTS

The small column ore only flow-through experiments were conducted with four separate designs: control, mixed culture (without methanotroph), S-oxidizer only, and methanotroph only (Table 1). The control and mixed culture columns were performed in duplicate. The concentrations of Cu and S in the column effluent were highest in the S-oxidizer and Methanotroph only columns (Figure 4). There were no significant differences in the concentrations of Cu and S in the mixed culture and control column effluents.

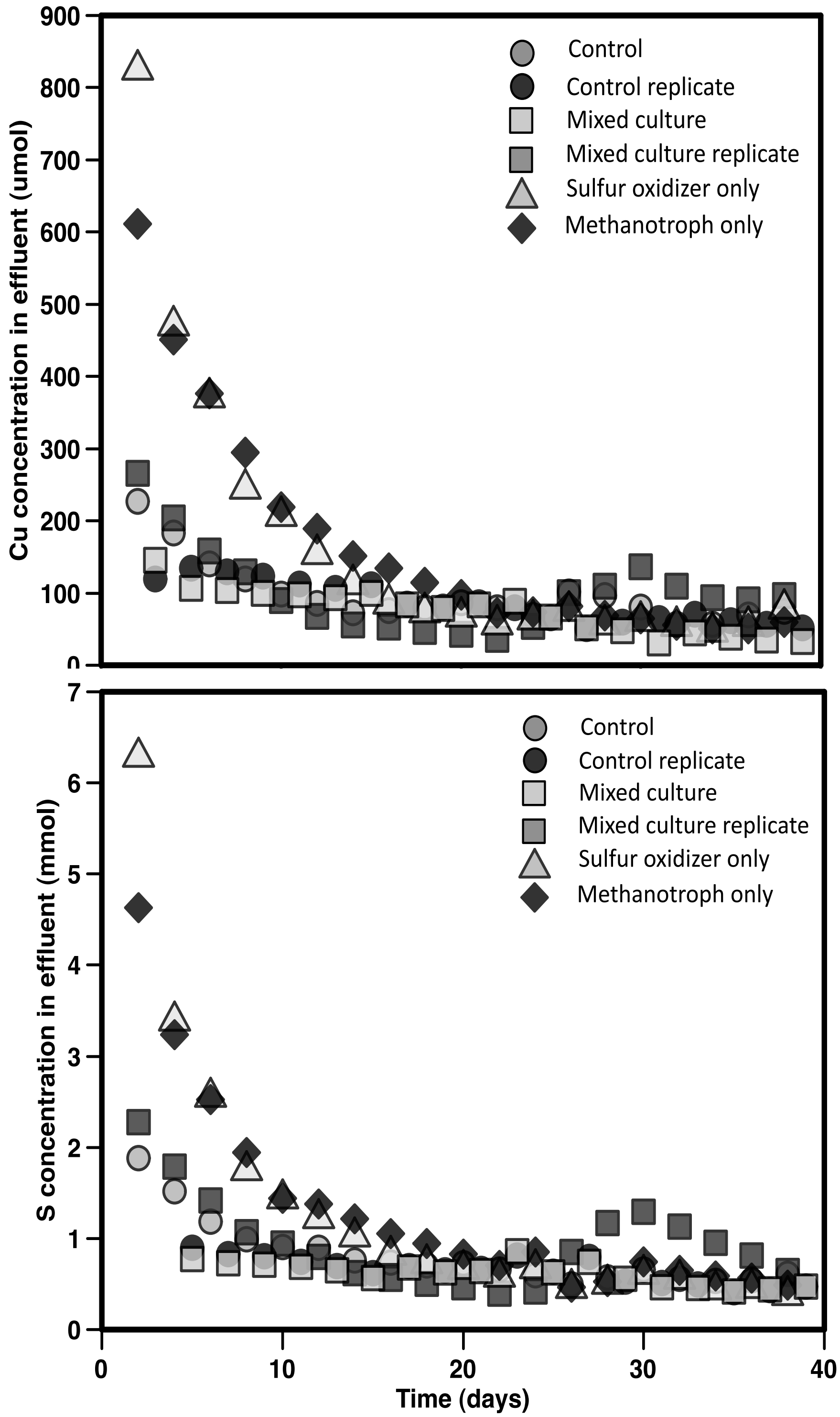



Figure 4: Cu and S concentration in small column ore-only effluent over the duration of the flow-through experiment.

The full profile small column flow-through experiments had five separate designs: control, mixed culture (without methanotroph), mixed culture (with methanotroph), S-oxidizer only, and methanotroph only (Table 2). The concentration of Cu and S in the effluents of these column yielded similar concentrations in all experiments, with the exception of Cu in the mixed culture (with methanotroph), which was significantly lower (Figure 5).

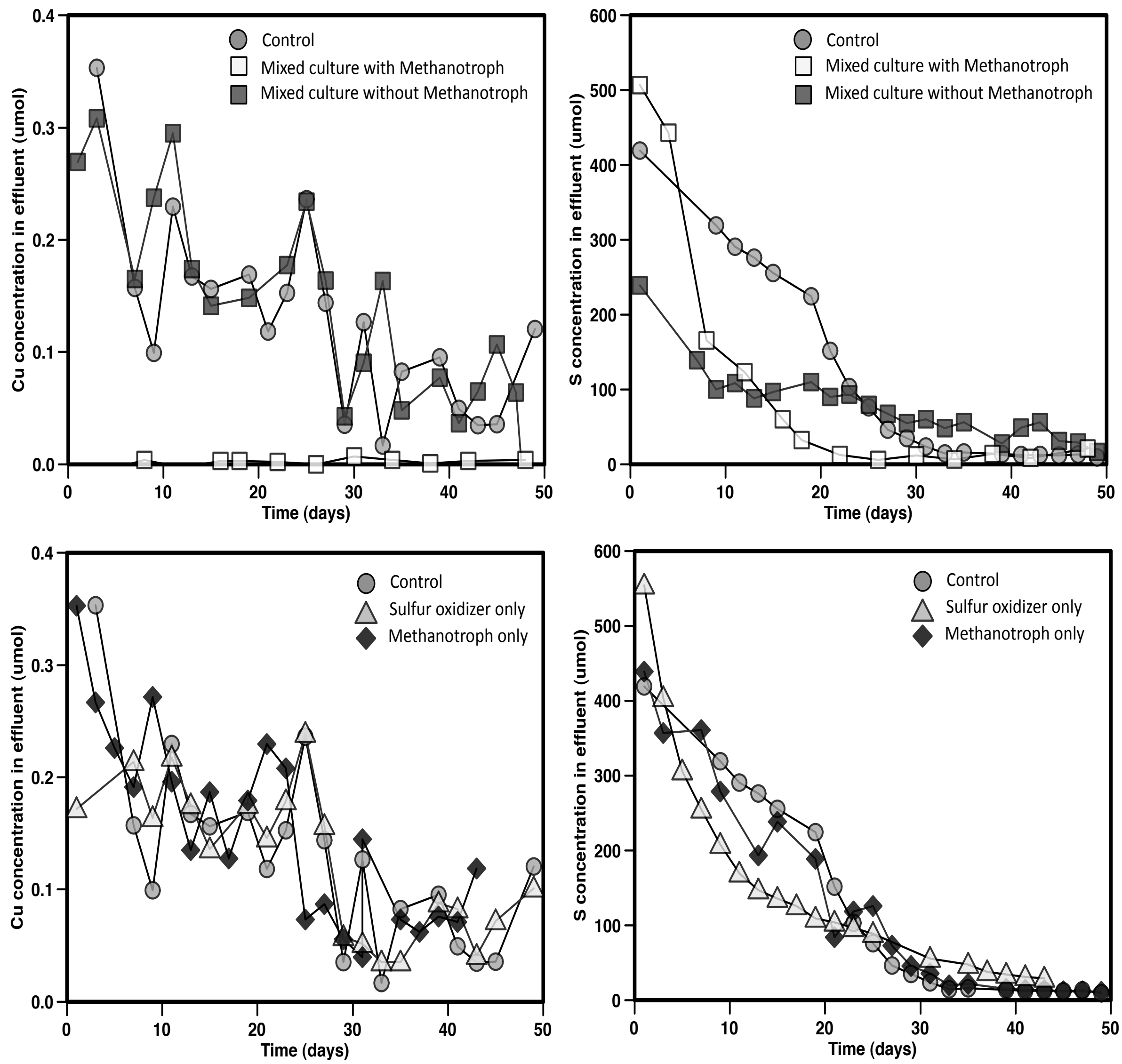



Figure 5: Cu and S concentration in effluent of full profile small columns over the duration of the flow-through experiment.

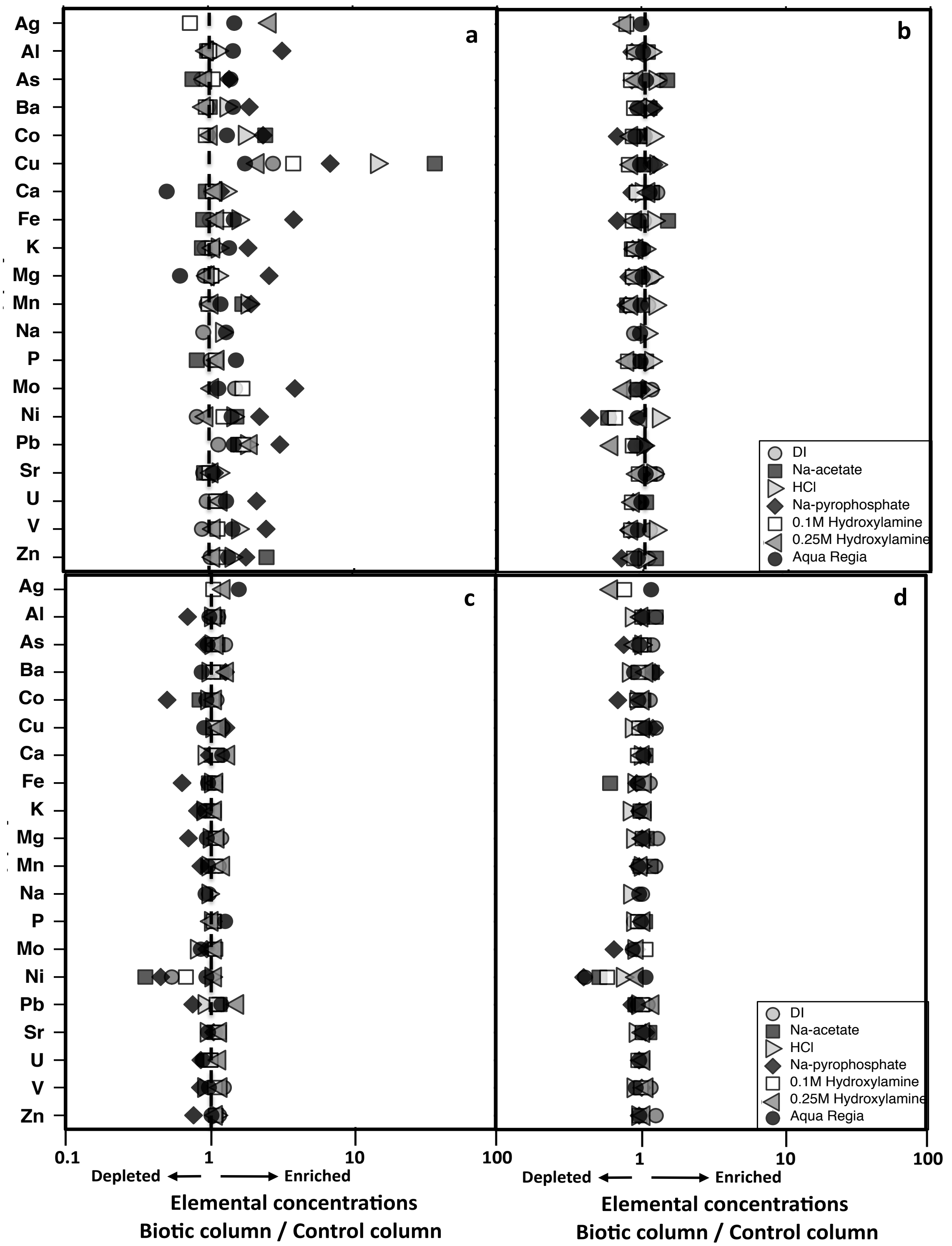



Figure 6: Extractions on soil zone of small column full profile experiments a) mixed culture with methanotroph b) mixed culture without methanotroph c) methanotroph only d) S-oxidizer only. Results are presented as concentration in biotic column normalized by concentration in control column.

The solid phase extractions on the soil zone of these columns demonstrate that only the mixed culture (with methanotroph) yielded any significant enrichment of elements compared to the control (Figure 6). In this column, Cu was significantly enriched in all extractions, especially Na-acetate, HCl, and Na-pyrophosphate, which target carbonates, amorphous Fe-oxides and organic matter, respectively. Many other elements, specifically Al, Fe, Mo, Ni, U, V, and Zn were also enriched in the Na-pyrophosphate extraction. The depth profile of the mixed culture (with methanotroph) column demonstrates that while all depths were enriched with Cu, the soil zone and top depth of the gravel zone are the most enriched (Figure 7). Total viable biomass is enriched at the bottom depth of the gravel zone, only in the mixed culture (with methanotroph) column.

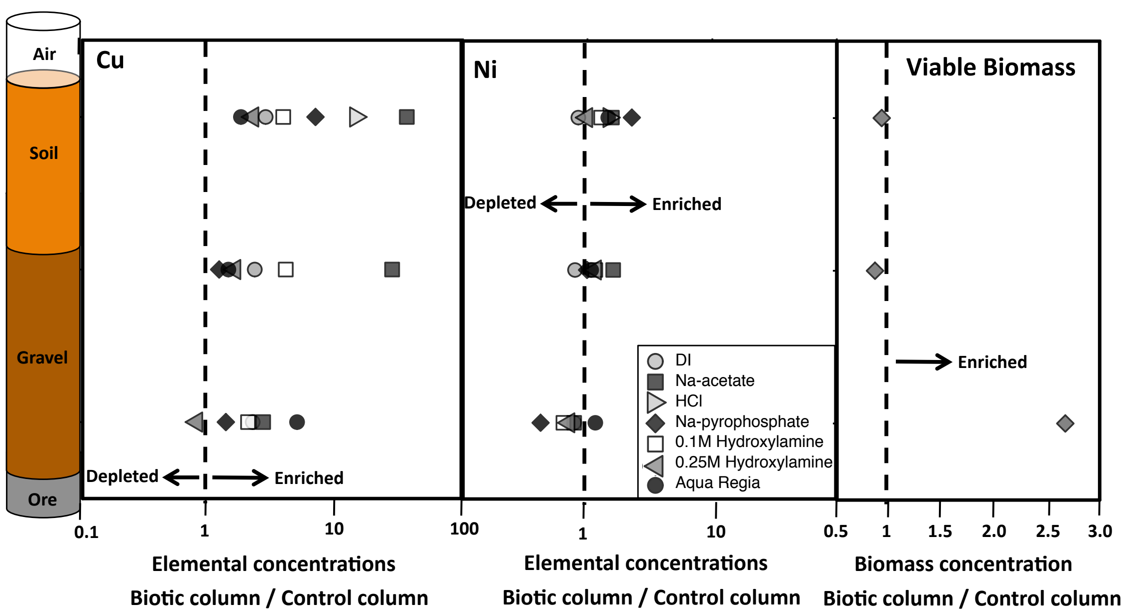



Figure 7: Cu and Ni solid phase elemental composition and total viable microbial biomass along the depth profiles of the small column full profile experiment inoculated with the mixed culture (with methanotroph). Results are presented as concentration in biotic column normalized by concentration in control column.

The large column full profile flow-through experiment consisted of two columns, one that was inoculated with a mixed culture (with methanotroph) and one that was not inoculated to serve as a control (Table 3). The concentrations of As, Mo, Cu and S (Figure 8), as well as all other quantifiable cations in the effluents were not distinctly different between the control and inoculated column. The anions nitrate, nitrite, orthophosphate, chloride and sulfate were measured in the large column effluents. The only difference between the biotic and control column of the quantifiable anions (Figure 9) was a more rapid decrease in nitrate in the biotic column, compared to the control. The other chemical parameters that were monitored in the effluent, pH, Eh, and conductivity, also did not vary between the control and inoculated columns (Figure 10). The pH of the fluid collected from the port within the ore zone of the biotic large column was less acidic, compared to the control.

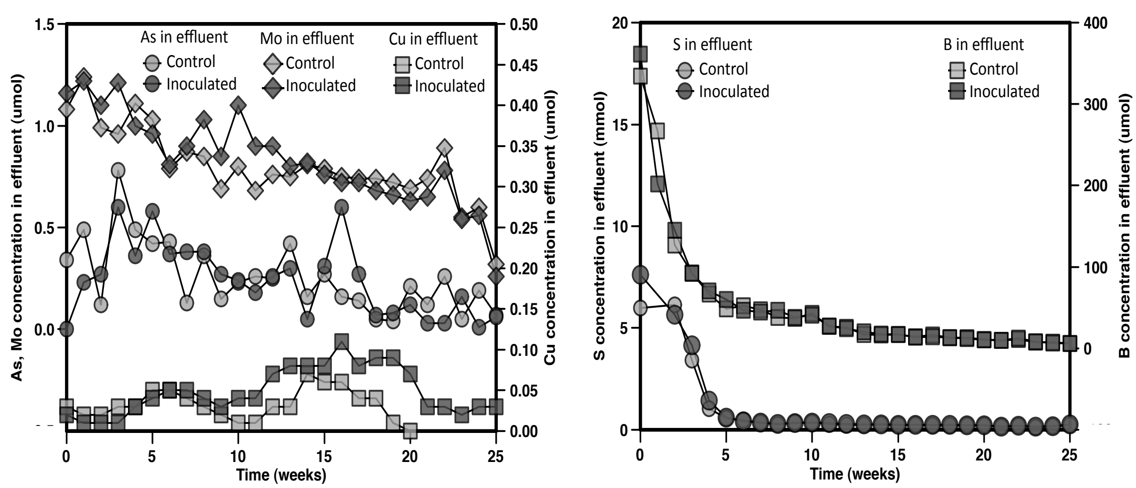



Figure 8: As, Cu Mo, and S concentration in effluent of full profile Arrieros/Los Bronces large columns over the duration of the flow-through experiment.

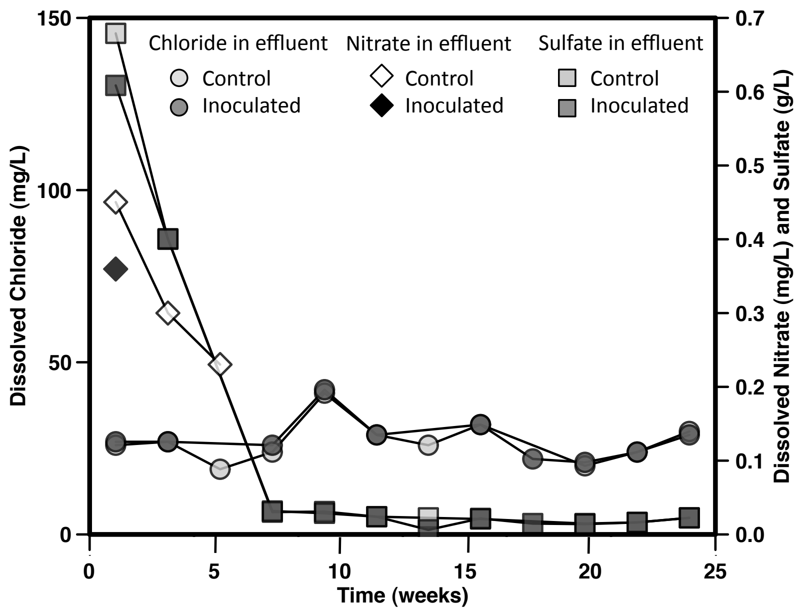



Figure 9: Chloride, nitrate and sulfate concentration in effluent of full profile large columns over the duration of the flow-through experiment.

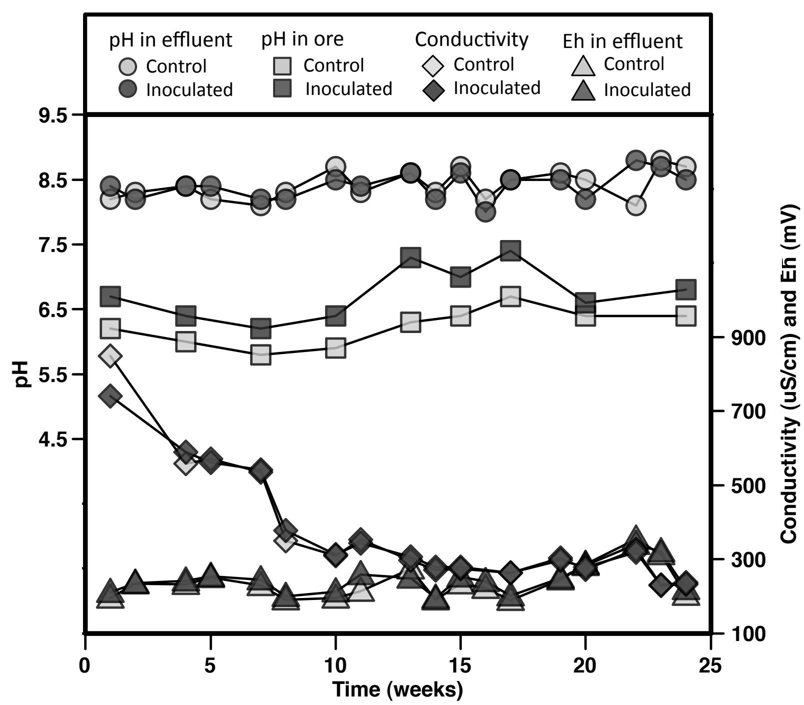



Figure 10: Conductivity, pH and Eh in the flow-through column effluent, and pH in the effluent from the ore in the full profile large columns over the duration of the flow-through experiment.

The solid phase extractions of the large columns soil profile (Figure 11) yielded enrichments of Cu, Co, Fe, Ni and Zn in the Na-acetate extraction; which extracts the carbonate phase. The Na-pyrophosphate extraction, which targets the organic phase, yielded enrichments in As and Cu. Elemental enrichments in the 0.1M Hydroxylamine extraction, which targets metals bound to Mn-oxides, only yielded an enrichment of molybdenum at the top depth of the soil. Depletions of Mo occurred in the HCl extractions at both depths, and Ag was depleted in all extractions at the top depth only.

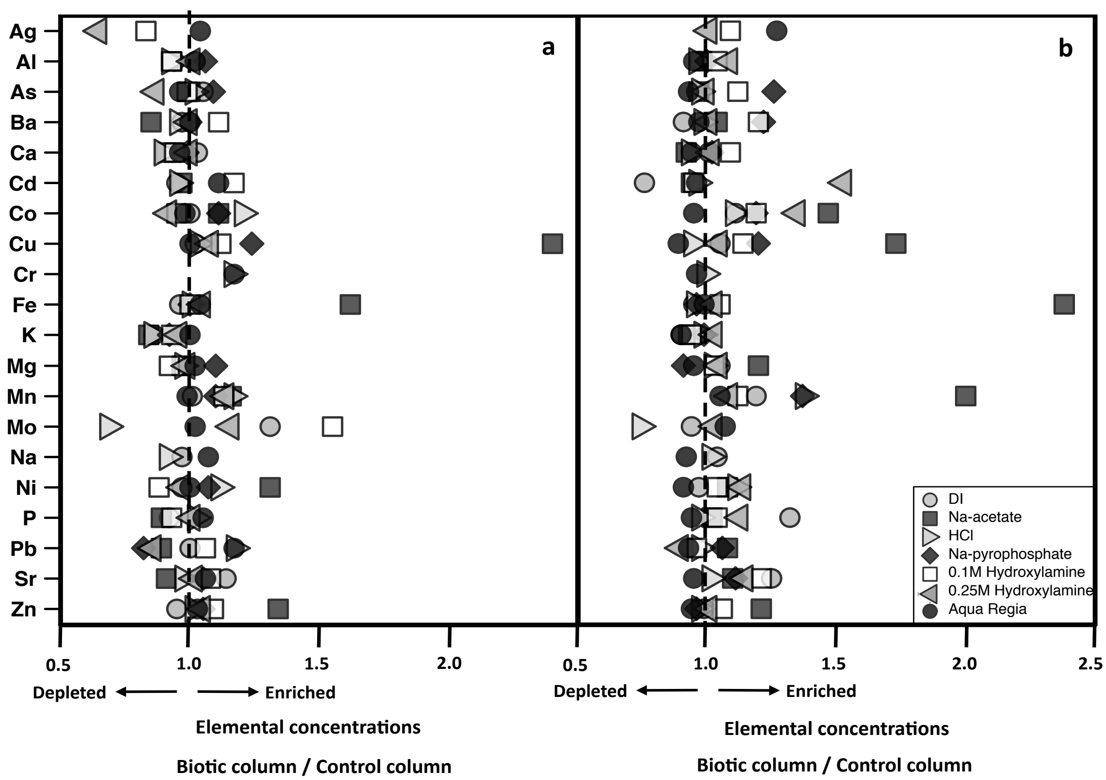



Figure 11: Large column extractions on the a) top depth b) bottom depth of soil profile. Results are presented as concentration in biotic column normalized by concentration in control column.

The distribution of Cu and Ni enrichments throughout the profile of the entire column (Figure 12) demonstrates that the soil top depth and gravel top depth in the biotic column are the most enriched compared to the control. The Na-acetate extraction, which targets the carbonate phase, contains the largest elemental enrichments throughout the columns.

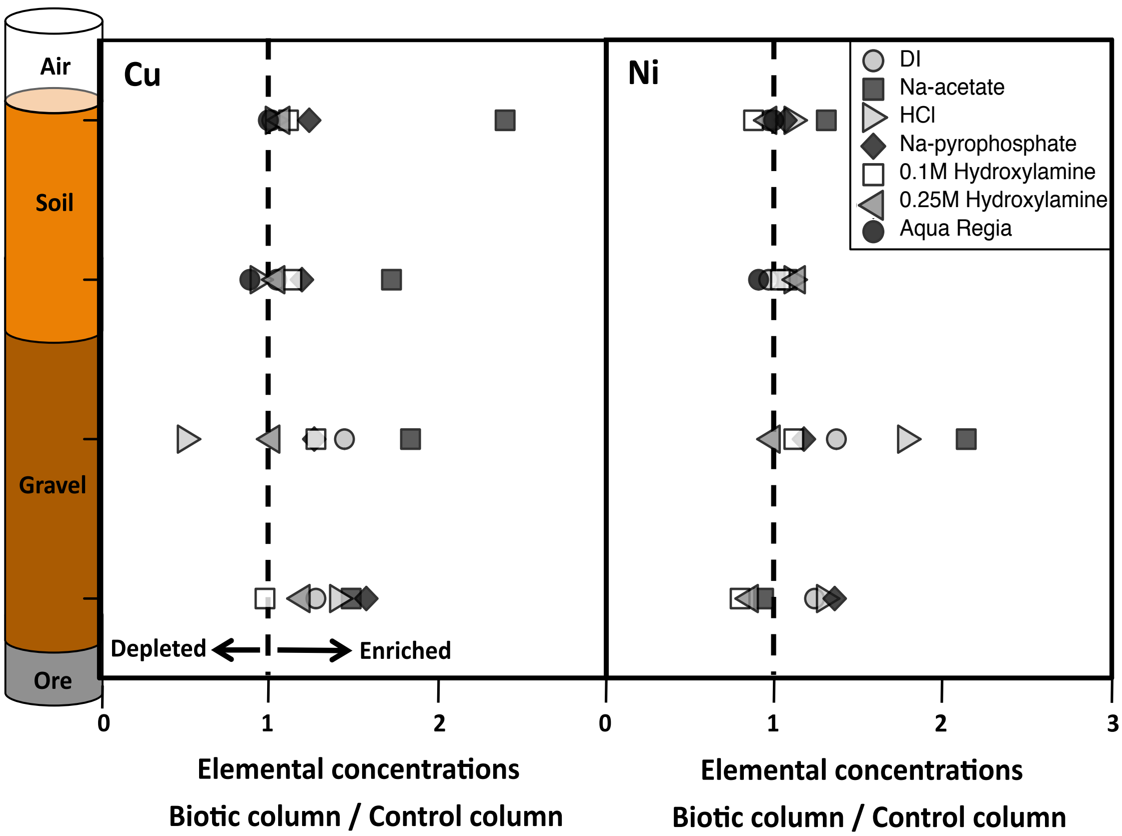



Figure 12: Elemental concentrations (Cu and Ni) in solid phase extractions in the large column profile. Results are presented as concentration in biotic column normalized by concentration in control column.

## DISCUSSION

To examine metal release from ore, small column ore-only flow-through experiments were completed. The highest rate of metal release occurred in the columns inoculated with a single organism, specifically a methanotroph and a sulfur-oxidizer (Figure 4). Metal content of the effluent of the mixed culture (without methanotroph) was not significantly different from the control (Figure 4). It should be noted, however, that the experiment was not completed with a mixed culture that contained a methanotroph. During the 40-day duration of the flow-through experiment a total of approximately 6 mmol of Cu was released from each of the columns inoculated with a single-organism, while the control released approximately 2 mmol. By the termination of the flow-through experiment, however, Cu concentrations in all columns were approximately the same. Due to interferences from the ore material, neither total biomass determination nor direct microscopic counting could quantify the status of the microbial cultures in the columns. It is, therefore, possible that the organisms did not survive, and with subsequent inoculations the single-organism columns would continue to have a higher rate of metal release. Metal content of the effluent of the mixed culture (without methanotroph) was not significantly different from the control. This is unexpected, as the S-oxidizer, which increased metal release in monoculture, was also present in the mixed culture. It should be noted, however, that the experiment was not completed with a mixed culture that contained a methanotroph.

The sequestration of metals in the soil zone was investigated in small columns with a full profile of gravel and soil overlying the ore. This flow-through experiment was completed with duplicate controls, a mixed culture (without methanotroph), a mixed culture (with methanotroph), a methanotroph only, and a sulfur-oxidizer only. The metal content in the effluent of these columns were similar, with the exception of the Cu content from the mixed culture (with methanotroph) column (Figure 5). The lack of Cu in the effluent from the column inoculated with the mixed culture (with methanotroph) suggests that there was a greater amount of metal sequestration in the soil zone. This result is confirmed by the selective extractions on the soil zone of the small column flow-through experiments (Figure 6). There are Cu enrichments in all extractions of the mixed culture (with methanotroph) column, with extreme enrichments (5-100 times) occurring in the Na-acetate, HCl and Na-pyrophosphate extractions. The Na-acetate extraction targets carbonate phases in the soil, and while the HCl extraction will target amorphous Fe-oxides, in this case carbonates phases are likely more dominant. The other major phase of the soil containing a large Cu enrichment is organic matter, targeted by the Na-pyrophosphate extraction. Several other elements were also enriched in the organic matter fraction of the soil, specifically Al, Fe, Mo, Ni, Pb, U, V, and Zn. The soil organic matter content, as determined by loss on ignition, was not different between any of the columns. The distribution of the Cu enrichment within the mixed culture (with methanotroph) column (Figure 7) demonstrates the organic matter fraction only enriched elements in the soil zone, while the carbonate fraction contained elemental enrichments in both the soil and gravel zones. There is microbial biomass enrichment, relative to the control, at the gravel-ore interface in this column. This suggests that the activity of the methanotroph with the mixed culture released substantially more Cu from the ore. The lack of Cu in the effluent, however, suggests that the methanotroph may have also been present in the soil zone, and significantly sequestered the released Cu. It has been documented that methanotrophs actively dissolve solid minerals to scavenge Cu, and uptake the Cu for use in metabolic enzymes (Knapp et al., 2007; Kulczycki et al., 2011; Kulczycki et al., 2007). Therefore, it is possible that both active dissolution of the ore and subsequent sequestration in the soil could be occurring due to the activity of the methanotroph. Indeed, one of the upward metal transport mechanisms likely occurring in the columns is sorption and uptake by microbial cells, which then move through the column to the soil zone without geochemical interaction (Ferris et al., 1987).

To further investigate the Cu mobility due to the presence of a mixed culture (with methanotroph), large column flow-through experiments were completed. The cation (Figure 8) and anion (Figure 9) content in the effluent of the large flow-through columns yielded no quantifiable difference between the inoculated and control columns. This is unexpected, as the same inoculation in the small column experiment resulted in drastically lower Cu content in the effluent. Similarly, the solid phase extractions did not result in the same extreme Cu enrichments in the biotic column, however the same pattern of elemental enrichments was beginning to develop (Figure 11). Specifically, Cu was enriched in the Na-acetate and Na-pyrophosphate extractions, and most elemental enrichments (Cu, Fe, Mn, Ni, Zn) occurred in the Na-acetate extraction. The Cu enrichment in the Na-acetate extraction was present throughout the column, at all depths and in all the zones

(Figure 12). As all other small column experiments, which were not inoculated with the mixed culture (with methanotroph) did not produce any substantial elemental enrichments (Figure 6) it is likely that the duration of the large column experiment was not adequate to produce the same extreme Cu enrichments in the soil zone. Indeed, there was approximately 50 times more material in the large columns, while the experiment duration was only 3.5 times longer.

Cu-porphyry deposits are found in arid terrain, and undergo cyclic periods of saturation (Enders et al., 2006; Sillitoe et al., 1996). Oxidation and acid generation occur when the ore is exposed to air and oxygenated groundwater, which mobilizes metals and allows for acidophilic sulfur-oxidizing bacteria to thrive, as modeled in previous flow-through experiments (Townley et al., 2007). Therefore, completing the flow-through column experiments in saturated conditions most likely decreased the amount of ore oxidation and metal mobility that occurred, compared to the Los Bronces Cu-porphyry deposit. This allowed for the investigation of biogeochemical processes other than sulfur- and iron-oxidation that most likely occur in the natural environment between periods of direct oxidation of the ore. This also allows for the application of this research to extend to other environments, such as the circumneutral soil zone overlying Cu-containing minerals. From this research, it is apparent that the methanotroph requirement for Cu affects the biogeochemical cycling of this element in the natural environment. While methanotroph metabolic activity has been well studied, methanotroph abundance and geochemical significance in the natural environment has only recently received attention (Fru, 2011; Leslie et al., 2012).

# CONCLUSION

Methanotrophic activity affects the cycling of Cu in the subsurface. The rate and extent of Cu release from ore is increased due to the activity of methanotrophs when present in a mixed culture. Similarly, transport and sequestration of Cu in the soil zone is also increased due to methanotrophic activity. These results are in agreement with previously documented metabolic studies of methanotrophs (Knapp et al., 2007; Kulczycki et al., 2011; Kulczycki et al., 2007), and suggest that a methanotroph-Cu association should be found in the natural environment (Fru, 2011; Leslie et al., 2012b). These results demonstrate the importance of methanotroph activity in the cycling of Cu in the natural environment, and the usefulness of methanotroph abundance in the exploration for Cu-containing mineral deposits.

REFERENCES


Balasubramanian, R., Smith, S.M., Rawat, S., Yatsunyk, L.A., Stemmler, T.L., and Rosenzweig, A.C., 2012, Oxidation of methane by a biological dicopper centre: Nature, v. 465, p. 115-131.

Bawden, T.M., Einaudi, M.T., Bostick, B.C., Meibom, A., Wooden, J., Norby, J.W., Orobona, M.J.T., and Chamberlain, C.P., 2003, Extreme S-34 depletions in ZnS at the Mike gold deposit, Carlin Trend, Nevada: Evidence for bacteriogenic supergene sphalerite: Geology, v. 31, p. 913-916.

Enders, M.S., Knickerbocker, C., Titley, S.R., and Southam, G., 2006, The role of bacteria in the supergene environment of the Morenci Porphyry Copper Deposit, Greenlee County, Arizona: Economic Geology, v. 101, p. 59-70.

Ferris, F.G., Fyfe, W.S., and Beveridge, T.J., 1987, Bacteria as nucleation sites for authigenic minerals in a metal-contaminated lake sediment Chemical Geology, v. 63, p. 225-232.

Findlay, R.H., King, G.M., and Watling, L., 1989, Efficacy of phospholipid analysis in determining microbial biomass in sediments Applied and Environmental Microbiology, v. 55, p. 2888-2893.

Fru, E.C., 2011, Copper Biogeochemistry: A Cornerstone in Aerobic Methanotrophic Bacterial Ecology and Activity?: Geomicrobiology Journal, v. 28, p. 601-614.

Fru, E.C., Gray, N.D., McCann, C., Baptista, J.D., Christgen, B., Talbot, H.M., Ghazouani, A., Dennison, C., and Graham, D.W., 2011, Effects of copper mineralogy and methanobactin on cell growth and sMMO activity in Methylosinus trichosporium OB3b: Biogeosciences, v. 8, p. 2887-2894.

Heiri, O., Lotter, A.F., and Lemcke, G., 2001, Loss on ignition as a method for estimating organic and carbonate content in sediments: reproducibility and comparability of results: Journal of Paleolimnology, v. 25, p. 101-110.

Kenney, G.E., and Rosenzweig, A.C., 2012, Chemistry and biology of the copper chelator methanobactin: ACS Chemical Biology, v. 7, p. A-1.

Knapp, C.W., Fowle, D.A., Kulczycki, E., Roberts, J.A., and Graham, D.W., 2007, Methane monooxygenase gene expression mediated by methanobactin in the presence of mineral copper sources: Proceedings of the National Academy of Sciences of the United States of America, v. 104, p. 12040-12045.

Kulczycki, E., Fowle, D.A., Kenward, P.A., Leslie, K., Graham, D.W., and Roberts, J.A., 2011, Stimulation of Methanotroph Activity by Cu-Substituted Borosilicate Glass: Geomicrobiology Journal, v. 28, p. 1-10.

Kulczycki, E., Fowle, D.A., Knapp, C., Graham, D.W., and Roberts, J.A., 2007, Methanobactin-promoted dissolution of Cu-substituted borosilicate glass: Geobiology, v. 5, p. 251-263.

Leslie, K., van Geffen, P., Macfarlane, B., Oates, C., Kyser, T.K., and Fowle, D.A., 2012, Biogeochemical indicators of buried mineralization under cover, Talbot Lake, Manitoba: Manuscript submitted for publication.

Melchior, A., Dejonghe, L., and Hughes, G., 1996, A geomicrobiological study of soils collected from auriferous areas of Argentina: Journal of Geochemical Exploration, v. 56, p. 219-227.

Mielke, R.E., Pace, D.L., Porter, T., and Southam, G., 2003, A critical stage in the formation of acid mine drainage: Colonization of pyrite by Acidithiobacillus ferrooxidans under pH-neutral conditions: Geobiology, v. 1, p. 81-90.

Nelson, M., Kyser, K., Clark, A., and Oates, C., 2007, Carbon isotope evidence for microbial involvement in exotic copper silicate mineralization, Huinquintipa and Mina Sur, northern Chile: Economic Geology, v. 102, p. 1311-1320.

Nelson, M.A., Kyser, T.K., Clark, A.H., and Oates, C., 2009, Application of carbon isotope ratios in regolith to the exploration for buried exotic-type copper ore deposits, Collahuasi district, northern Chile: Geochemistry-Exploration Environment Analysis, v. 9, p. 3-8.

Rogers, J.R., and Bennett, P.C., 2004, Mineral stimulation of subsurface microorganisms: release of limiting nutrients from silicates: Chemical Geology, v. 203, p. 91-108.

Rogers, J.R., Bennett, P.C., and Choi, W.J., 1998, Feldspars as a source of nutrients for microorganisms: American Mineralogist, v. 83, p. 1532-1540.

Sillitoe, R.H., Folk, R.L., and Saric, N., 1996, Bacteria as mediators of copper sulfide enrichment during weathering: Science, v. 272, p. 1153-1155.

Southam, G., and Saunders, J.A., 2005, The geomicrobiology of ore deposits: Economic Geology, v. 100, p. 1067-1084.

Titley, S.R., 1975, Geological characteristics and environment of some porphyry copper occurences in the southwest Pacific: Economic Geology, v. 70, p. 499-514.

Townley, B., Puig, A., Ojeda, G., Luca, R., Vargas, T., and LeRoux, J., 2007, Understanding real time processes behind the development of surface geochemical expressions from ore bodies beneath cover: source to surface and detection by means of collector devices, *in* Milkereit, B., ed., Proceedings of Exploration 07; Fifth Decennial International Conference on Mineral Exploration, p. 1019-1021.

White, D.C., Davis, W.M., Nickels, J.S., King, J.D., and Bobbie, R.J., 1979, Determination of the sedimentary microbial biomass by extractable lipid phosphate Oecologia, v. 40, p. 51-62.

# CHAPTER 6. CONCLUSION

The composition of the deep subsurface biosphere is poorly understood, mostly due to challenges in sampling in this extreme environment (Moser et al., 2005; Pfiffner et al., 2006; Sahl et al., 2008). Microbial weathering of ore at depth has currently been documented to occur in oxidizing conditions, typically indirectly through the activity of Fe- and S- oxidizing bacteria (Enders et al., 2006; Sillitoe et al., 1996; Southam and Saunders, 2005). In Chapter 2 of this dissertation, I document the successful isolation of an organism in proximity to a buried Cu-Zn sulfide ore deposit that is capable of Fe-oxidation and increases the rate of ore weathering under non-oxidizing conditions. This organism is very unique, surviving both in a harsh environment in isolation and influencing metal dynamics at the site of collection. This clearly shows we need to expand our current understanding of the biogeochemical processes impacting metal mobility in the deep subsurface, and the retrieval of this organism provides the opportunity to study its role through controlled laboratory experiments (Chapter 4 and 5).

It has been previously documented that biogeochemical soil surveys can be used for the exploration of buried ore deposits, for example utilizing *Bacillus cereus* for gold exploration (Parduhn, 1991; Reith et al., 2005), however there are still many metal-microbe interactions in a variety of environments that are poorly understood (Wakelin et al., 2012). The biogeochemical survey at the Talbot prospect (Chapter 3) yielded associations between methanotroph abundance and Cu content in the clay size fraction and total microbial abundance and Zn content in the clay size fraction. The biogeochemical survey helped delineate the surface soil anomaly directly above mineralization, while the signal from the geochemical survey was dominated by fluid flow along structural paths (van Geffen et al., 2012). These results document that biogeochemical processes and microbe-metal associations can be used as tools in the search for buried ore deposits in more varied terrains and mineral deposit types.

Without a doubt, microorganisms are active, and perhaps controlling, subsurface biogeochemical processes; however, the extent and mechanisms of these controls on metal mobility in these environments has not been directly documented (Southam and Saunders, 2005). Column flow-through experiments, outlined in Chapter 4 and Chapter 5, not only illustrate that microorganisms increase the release of metals from ore and the subsequent sequestration in soil, but that specific microbial guilds exert geochemical controls depending upon the geochemistry of the natural environment. In Chapter 3 and Chapter 2, these specific microbe-metal associations were demonstrated to be present in the soil overlying a buried deposit and in the deep subsurface in proximity to a buried deposit.

The field investigations and laboratory column flow-through experiments completed during the course of this research demonstrates that the biogeochemical processes of specific microbial guilds, depending upon the geochemistry of the environment, increase the rate of weathering and enhance surface soil anomaly development. This research demonstrates that integrating biogeochemical analyses with standard geochemical exploration techniques can serve as a novel tool in the search for buried mineral deposits. Further research and development is required, including expanding known microbe-metal associations and geomicrobiology of ore deposits, developing rapid *in situ* biomass quantification methods to determine areas of low soil microbial abundance overlying mineralization, investigating microbial indicators of toxicity, and correlating microbial ecology with isotopic composition of surface materials.

## REFERENCES

Druschel, G.K., Labrenz, M., Thomsen-Ebert, T., Fowle, D.A., and Banfield, J.F., 2002, Geochemical Modeling of ZnS in biofilms: An example of ore depositional processes: Economic Geology and the Bulletin of the Society of Economic Geologists, v. 97, p. 1319-1329.

Enders, M.S., Knickerbocker, C., Titley, S.R., and Southam, G., 2006, The role of bacteria in the supergene environment of the Morenci Porphyry Copper Deposit, Greenlee County, Arizona: Economic Geology, v. 101, p. 59-70.

Mohagheghi, A., Updegraff, D.M., and Goldhaber, M.B., 1985, The role of sulfate reducing bacteria in the deposition of sedimentary uranium ores: Geomicrobiology Journal, v. 4, p. 153-173.

Moser, D.P., Gihring, T.M., Brockman, F.J., Fredrickson, J.K., Balkwill, D.L., Dollhopf, M.E., Lollar, B.S., Pratt, L.M., Boice, E., Southam, G., Wanger, G., Baker, B.J., Pfiffner, S.M., Lin, L.H., and Onstott, T.C., 2005, Desulfotomaculum and Methanobacterium spp. dominate a 4-to 5-kilometer-deep fault: Applied and Environmental Microbiology, v. 71, p. 8773-8783.

Parduhn, N.L., 1991, A microbial method of mineral exploration - A case-history at the Mesquite deposit Journal of Geochemical Exploration, v. 41, p. 137-149.

Pfiffner, S.M., Cantu, J.M., Smithgall, A., Peacock, A.D., White, D.C., Moser, D.P., Onstott, T.C., and van Heerden, E., 2006, Deep subsurface microbial biomass and community structure in Witwatersrand Basin mines: Geomicrobiology Journal, v. 23, p. 431-442.

Reith, F., McPhail, D.C., and Christy, A.G., 2005, Bacillus cereus, gold and associated elements in soil and other regolith samples from Tomakin Park Gold Mine in southeastern New South Wales, Australia: Journal of Geochemical Exploration, v. 85, p. 81-98.

Sahl, J.W., Schmidt, R.H., Swanner, E.D., Mandernack, K.W., Templeton, A.S., Kieft, T.L., Smith, R.L., Sanford, W.E., Callaghan, R.L., Mitton, J.B., and Spear, J.R., 2008, Subsurface microbial diversity in deep-granitic-fracture water in Colorado: Applied and Environmental Microbiology, v. 74, p. 143-152.

Sillitoe, R.H., Folk, R.L., and Saric, N., 1996, Bacteria as mediators of copper sulfide enrichment during weathering: Science, v. 272, p. 1153-1155.

Southam, G., and Saunders, J.A., 2005, The geomicrobiology of ore deposits: Economic Geology, v. 100, p. 1067-1084.

van Geffen, P.W.G., Kyser, T.K., Oates, C.J., and Ihlenfeld, C., 2012, Till and vegetation geochemistry at the Talbot VMS Cu-Zn prospect, Manitoba, Canada: implications for mineral exploration: Geochemistry-Exploration Environment Analysis, v. 12, p. 67-86.

Wakelin, S., Anand, R.R., Macfarlane, C., Reith, F., Noble, R., and Rogers, S., 2012, Assessing microbiological surface expression over an overburden-covered VMS deposit: Journal of Geochemical Exploration, v. 112, p. 262-271.

# APPENDIX A. MODELING A MAGMATIC-NICKEL DEPOSIT IN COLUMN FLOW-THROUGH STUDIES

In the previous chapters (Chapter 4 and Chapter 5), flow-through column experiments were completed for Cu-Zn VMS and Cu-porphyry deposits. The same experiments were also completed for the magmatic-Ni deposit Raglan mine, Quebec, Canada. Briefly, small ore-only, small full profile, and large full profile column experiments were completed with magmatic Ni-ore, finely crushed (<200μm) glacial till, and organic rich soil. All columns were inoculated with a mixed culture (Table 1).

Table 1: Mixed culture used for inoculation of column flow-through experiments.

| Organism metabolism | Organism name |
|---|---|
| S-oxidizer | *Acidithiobacillus thiooxidans* |
| Fe-oxidizer/Heterotroph | *Marinobacter sp.* |
| S-, Fe-oxidizer | *Acidithiobacillus ferrooxidans* |
| Fe-reducer | *Geobacter metallireducens* |
| S-reducer | *Desulfovibrio desulfuricans* |
| Methanotroph | *Methylococcus capsulatus, Methylosinus trichosporium* |
| Methanogen | *Methanobacterium formicicum* |

The elemental concentrations in the effluent from the ore-only small flow-through Raglan columns demonstrate slightly higher release of Ni and Zn from the mixed culture experiment throughout the entire duration (Figure 1), while the effluent from the full profile columns yielded no difference between the biotic and control (data not shown).

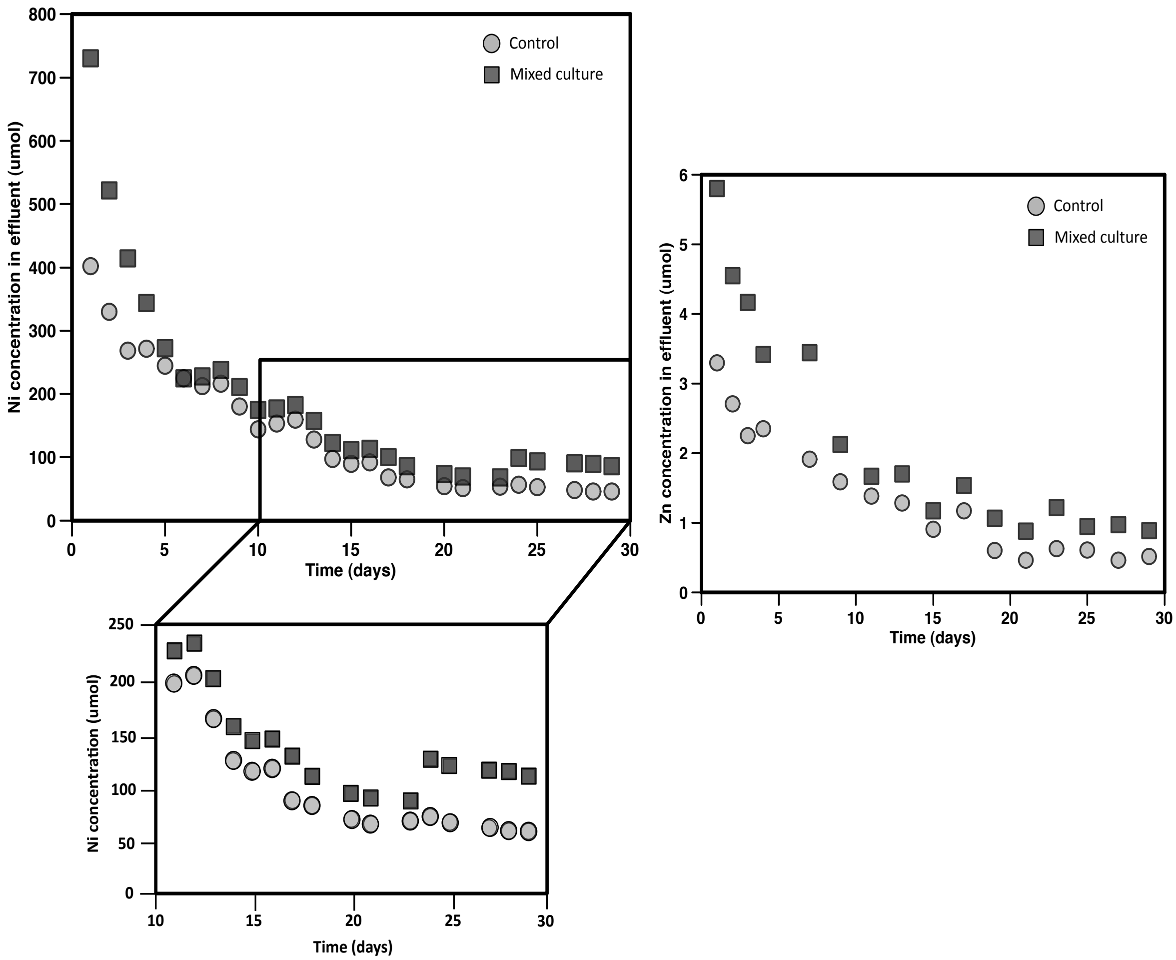



Figure 1: Ni and Zn concentration in small column Raglan ore only effluent over the duration of the flow-through experiment.

The solid phase extractions on the small column full profile Raglan materials (Figure 2) yielded enrichments in the 0.1M and 0.25M Hydroxylamine extractions of the soil phase and enrichments in the DI and Aqua regia extraction of the top till profile. Soil organic matter was lower in the soil phase of biotic column (19%), compared to the control column (22%), however no differences in the total viable biomass were detected.

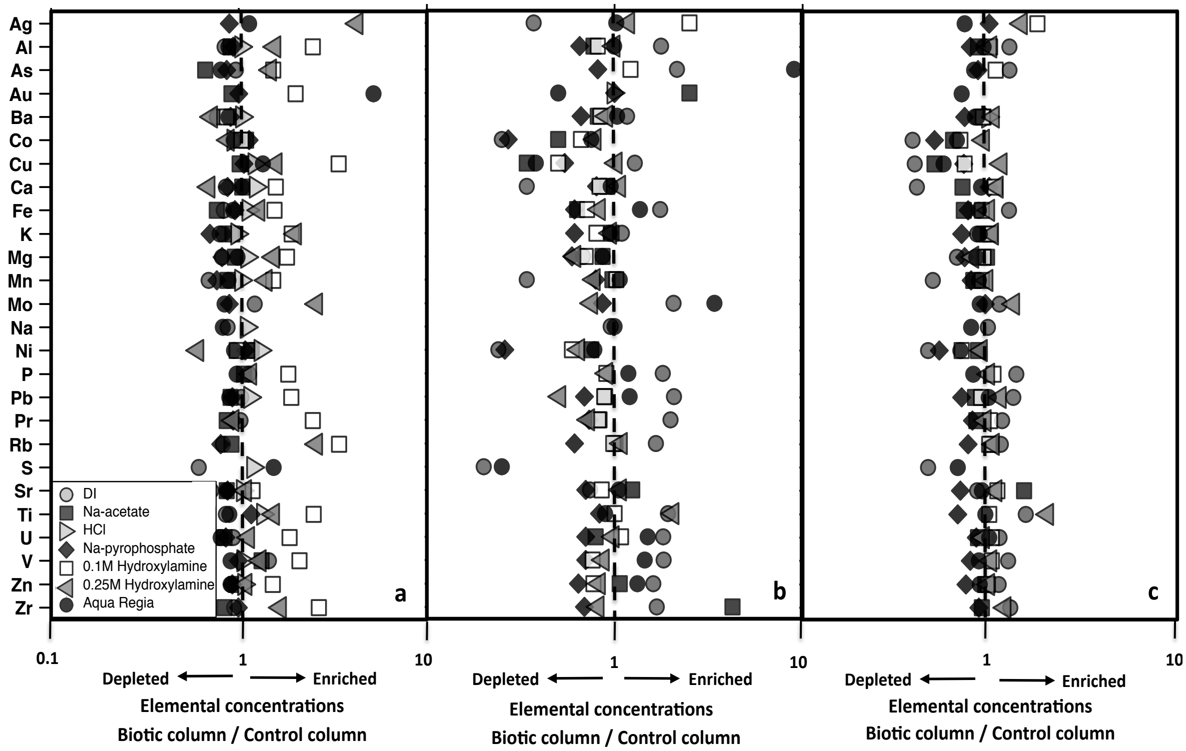



Figure 2: Solid phase extractions on Raglan small columns a) soil b) top of till c) bottom of till profile. Results are presented as concentration in biotic column normalized by concentration in control column.

The effluent of the large flow-through columns was monitored for dissolved metals, anions, pH, Eh and conductivity over the duration of the experiment (Figure 3). The concentrations of dissolved cations and anions, the pH, Eh, and conductivity were not different between the inoculation and control columns. The only exception was dissolved sulfate, which was higher in the control during the first 10 weeks of the flow-through experiment.

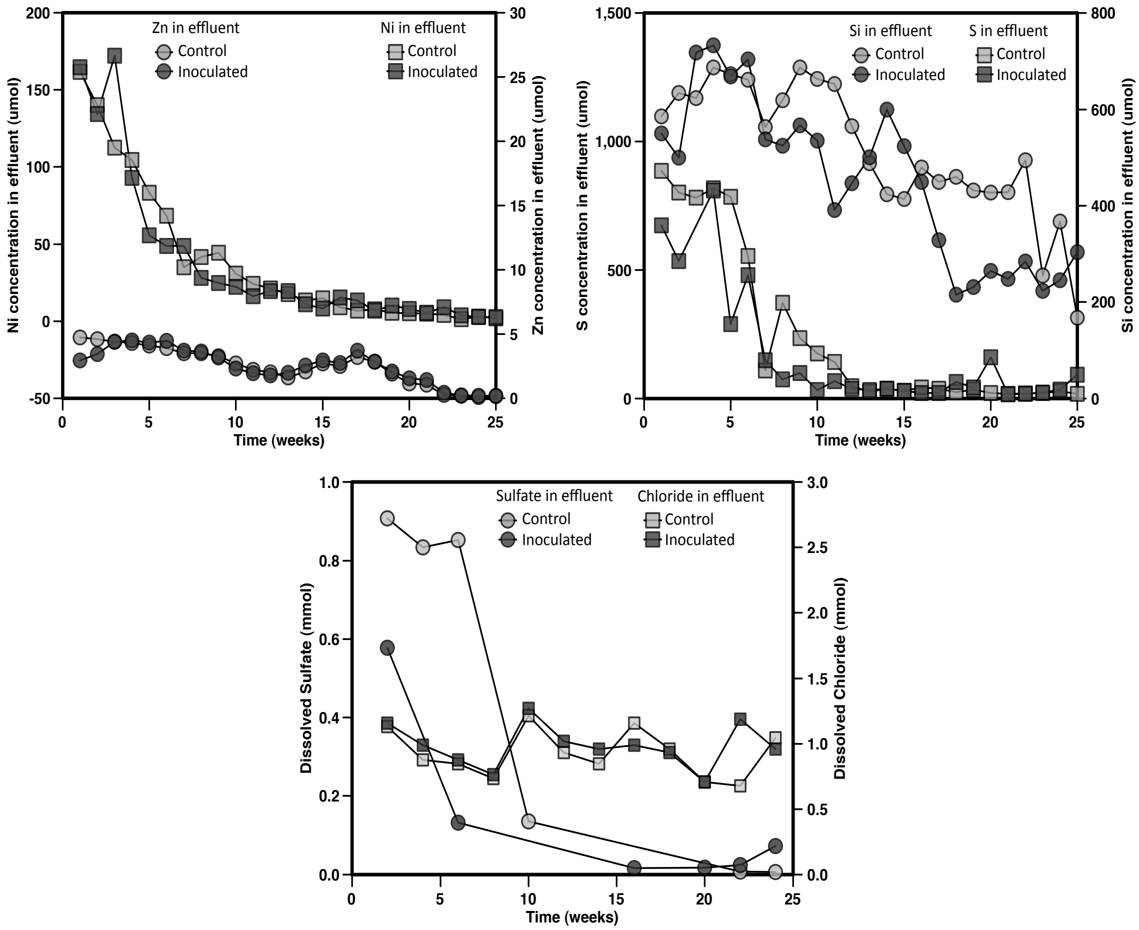



Figure 3: Elemental concentrations (Zn, Ni, S and Si) and dissolved anion concentrations (sulfate and chloride) in Raglan large column effluent over the duration of the experiment.

The extractions on the soil phase of the large column flow-through (Figure 4) demonstrated slight enrichments in the DI, HCl and Na-acetate extractions at the top of the soil profile. All elements were slightly enriched in all extractions in the bottom depth of the soil profile, most notably DI, HCl and aqua regia. The most enriched element at the base of the soil profile is Au, in the Na-pyrophosphate, DI, and Na-acetate extractions. The depth profile of solid phase extractions shows that the most elemental enrichments in the biotic column, when compared to control, occurred at the top of the till, and not the soil phase (Figure 5).

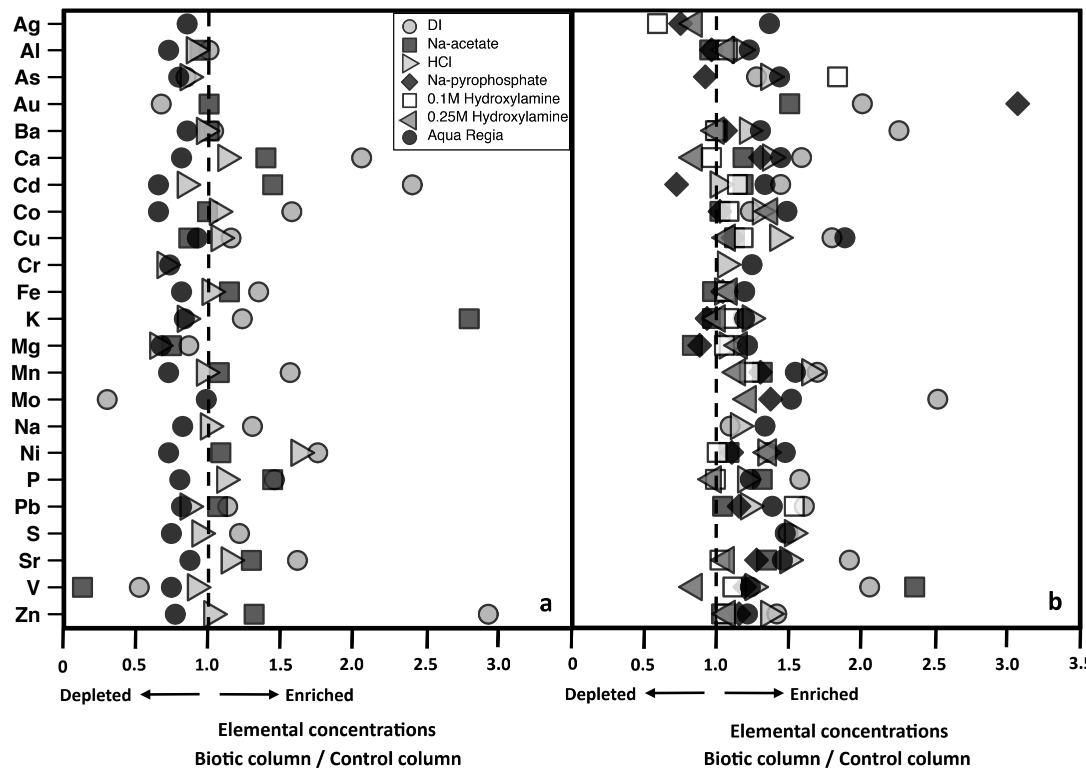



Figure 4: Solid phase extractions on Raglan large columns a) top of soil profile b) bottom of soil profile. Results are presented as concentration in biotic column normalized by concentration in control column.

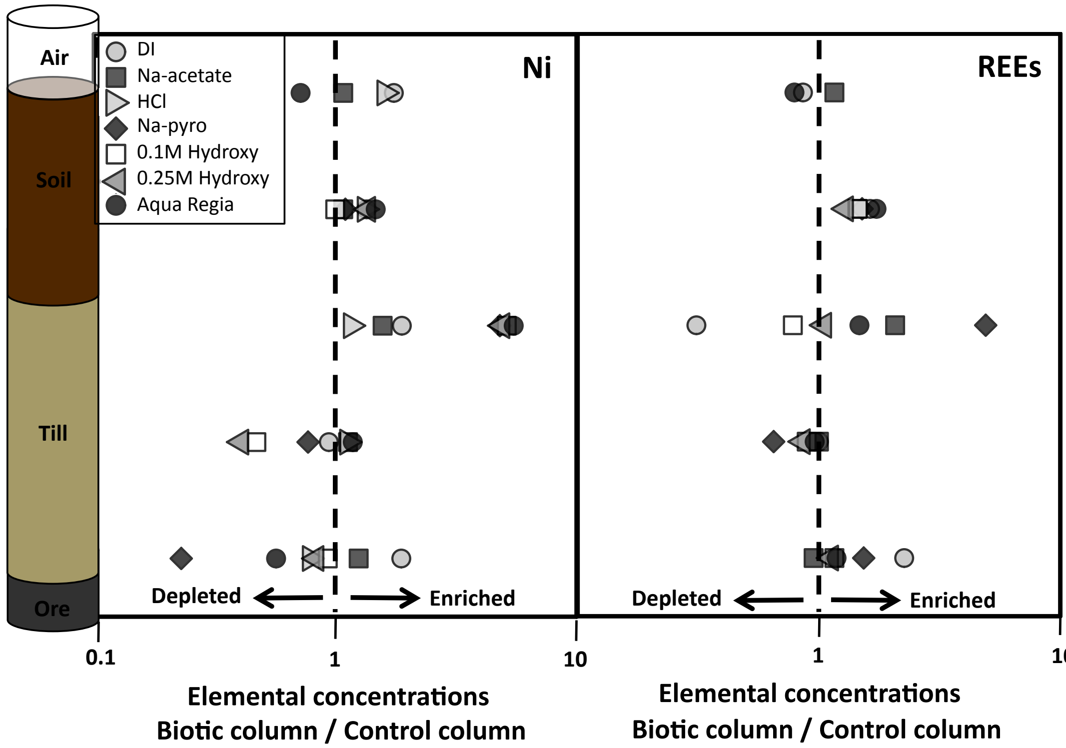



Figure 5: Elemental concentrations (Ni and REEs) in solid phase extractions on Raglan large columns profile. Results are presented as concentration in biotic column normalized by concentration in control column.

Comparing these results to the column studies modeling the Cu-Zn VMS and Cu-porphyry deposits, it is apparent that the biogeochemical controls on metal mobility in a magmatic-Ni deposit were not identified. The two most likely explanations for this result are the lack of an appropriate microorganism for use in this model or an inappropriate overburden grain size that limited hydraulic connectivity in the columns.

# APPENDIX B. TRIPLE 7 COLUMN AND BATCH EXPERIMENTS

## STERILIZED ORE-ONLY COLUMN EXPERIMENT

The Triple 7 ore-only flow-through column experiment was carried out with the following materials and experimental design: composite ore and pyrite, each inoculated with a S-oxidizer and the *Marinobacter* isolate, a control, and one column that contained sterilized material. The material was sterilized under UV light for a period of one week prior to experimental set-up (Figure 1).

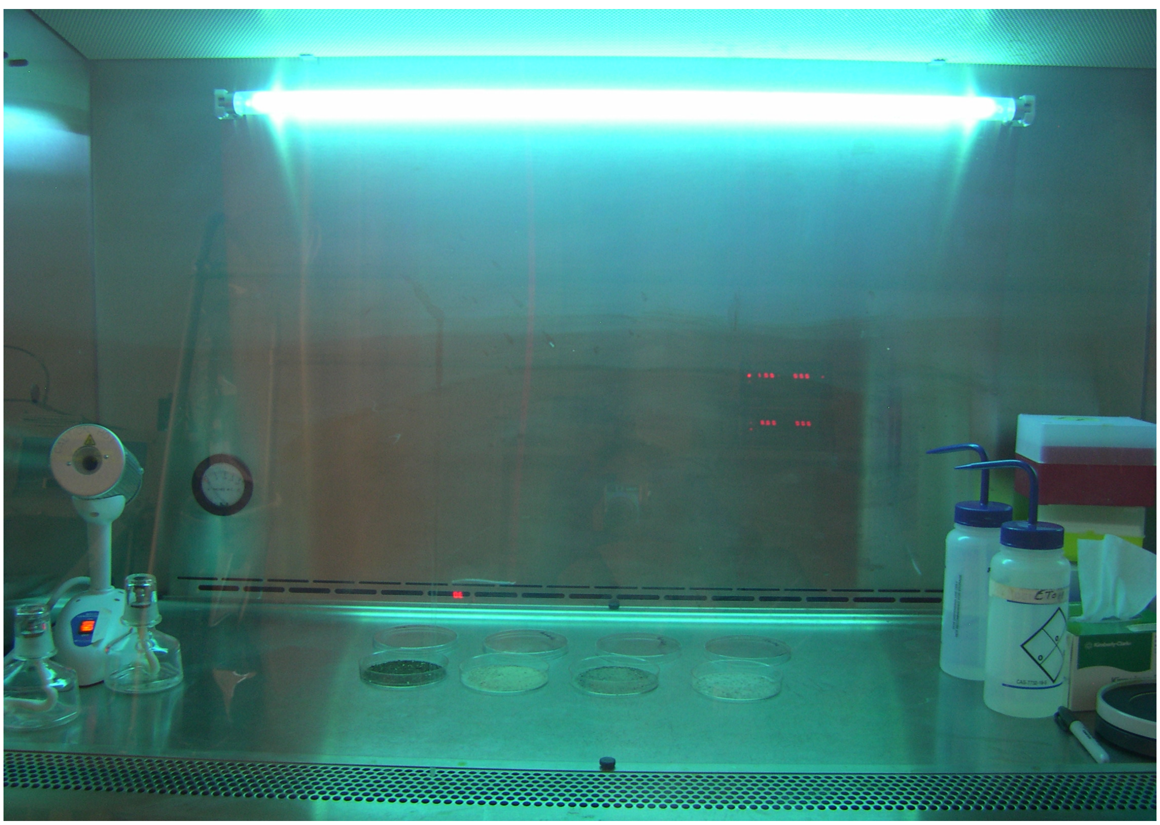


Figure 1: Sterilization of column material under UV light in a contained biohood.

The Zn concentration in the effluent of flow-through columns demonstrates that the sterilization of the ore material created active sites and significantly altered the metal release when compared to the control that was unsterilized, in both the composite ore (Figure 2) and the pyrite (Figure 3).

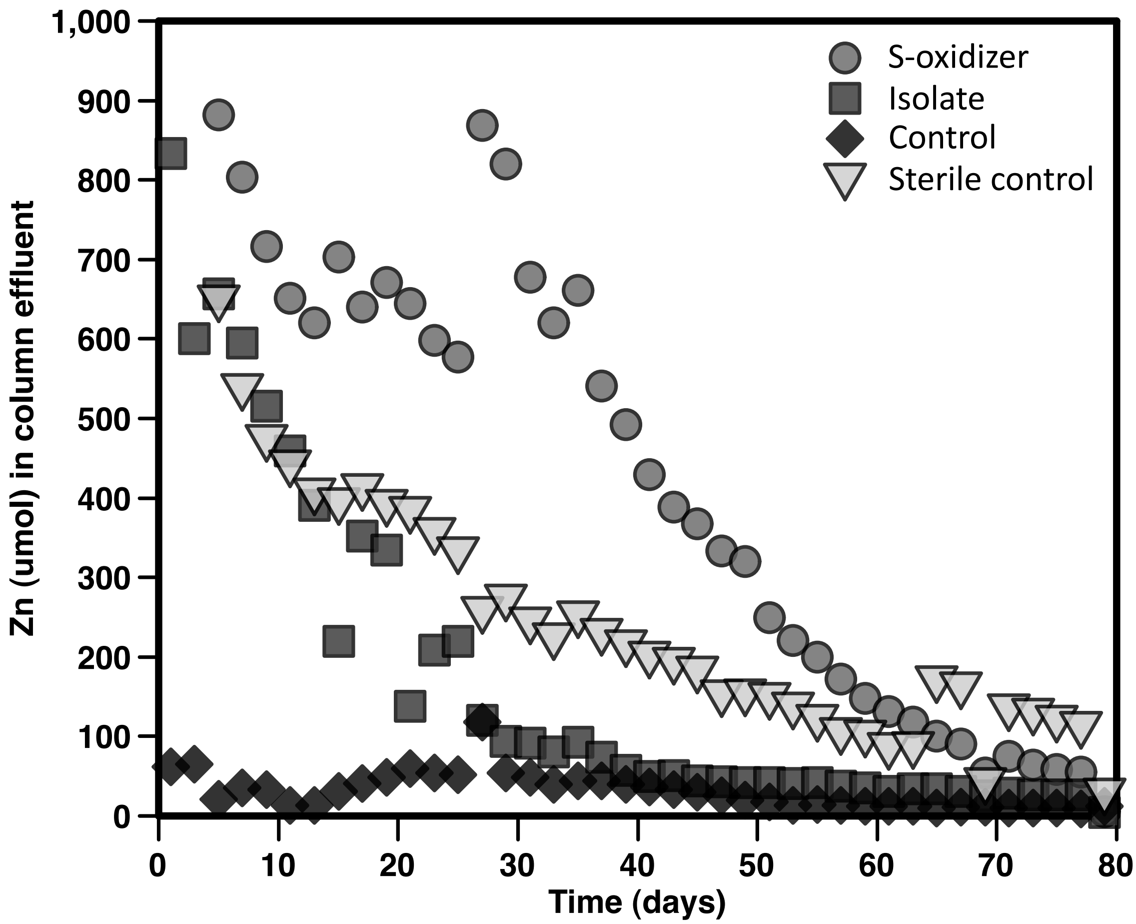



Figure 2: Zn concentration (umol) in the effluent of the composite ore-only flow-through column over the duration of the experiment.

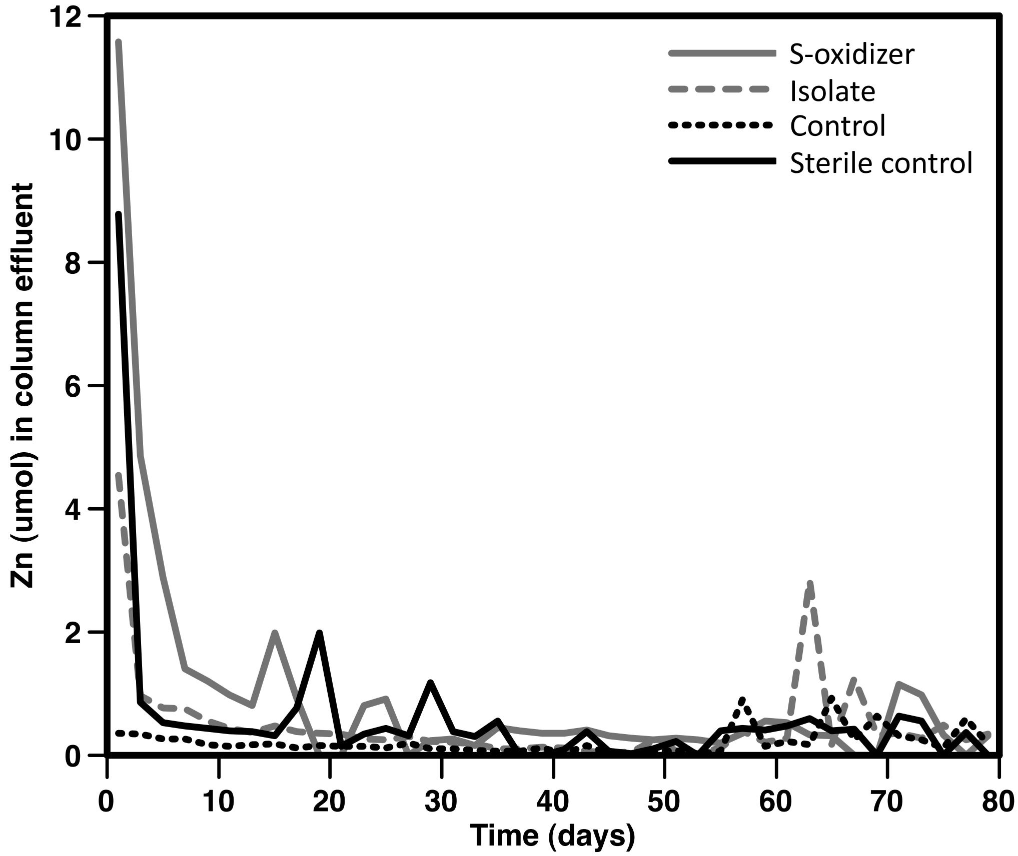



Figure 3: Zn concentration (umol) in the effluent of the pyrite-only flow-through column over the duration of the experiment.

In light of these results, all of the subsequent column experiments were completed without sterilizing the material. The controls consisted of unsterilized material that was not inoculated with additional microorganisms, and all other columns were inoculated with mixed cultures of laboratory organisms. Tests were also completed on sterilizing the columns, and it was concluded that cleaning with 10% HCl would be appropriate. All column fittings and tubing were autoclaved prior to experimental setup.

At the termination of the ore-only and pyrite-only flow-through column experiments, HCl (Figure 4) and MgCl (Figure 5) extractions were completed. The HCl extraction targets elements sorbed to the surface and amorphous minerals, while the MgCl extraction is a surface exchange protocol.

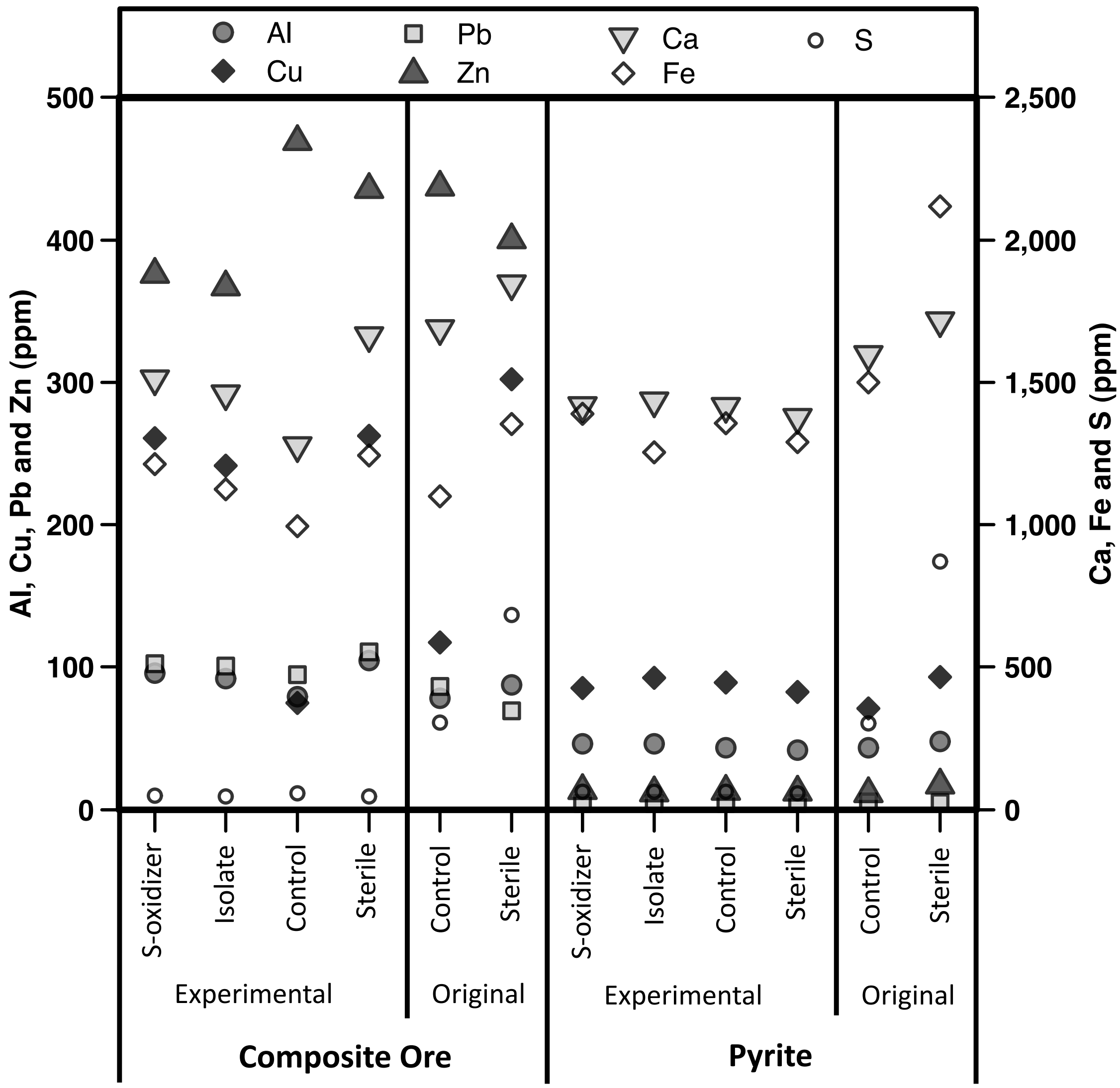



Figure 4: Al, Ca, Cu, Fe, S, Pb and Zn in the HCl extraction at the termination of the column flow-through experiment. Original control and sterile refers to extractions on material prior to the flow-through experiments, while experimental refers to extractions on the solid materials from the columns at the termination of the experiment.

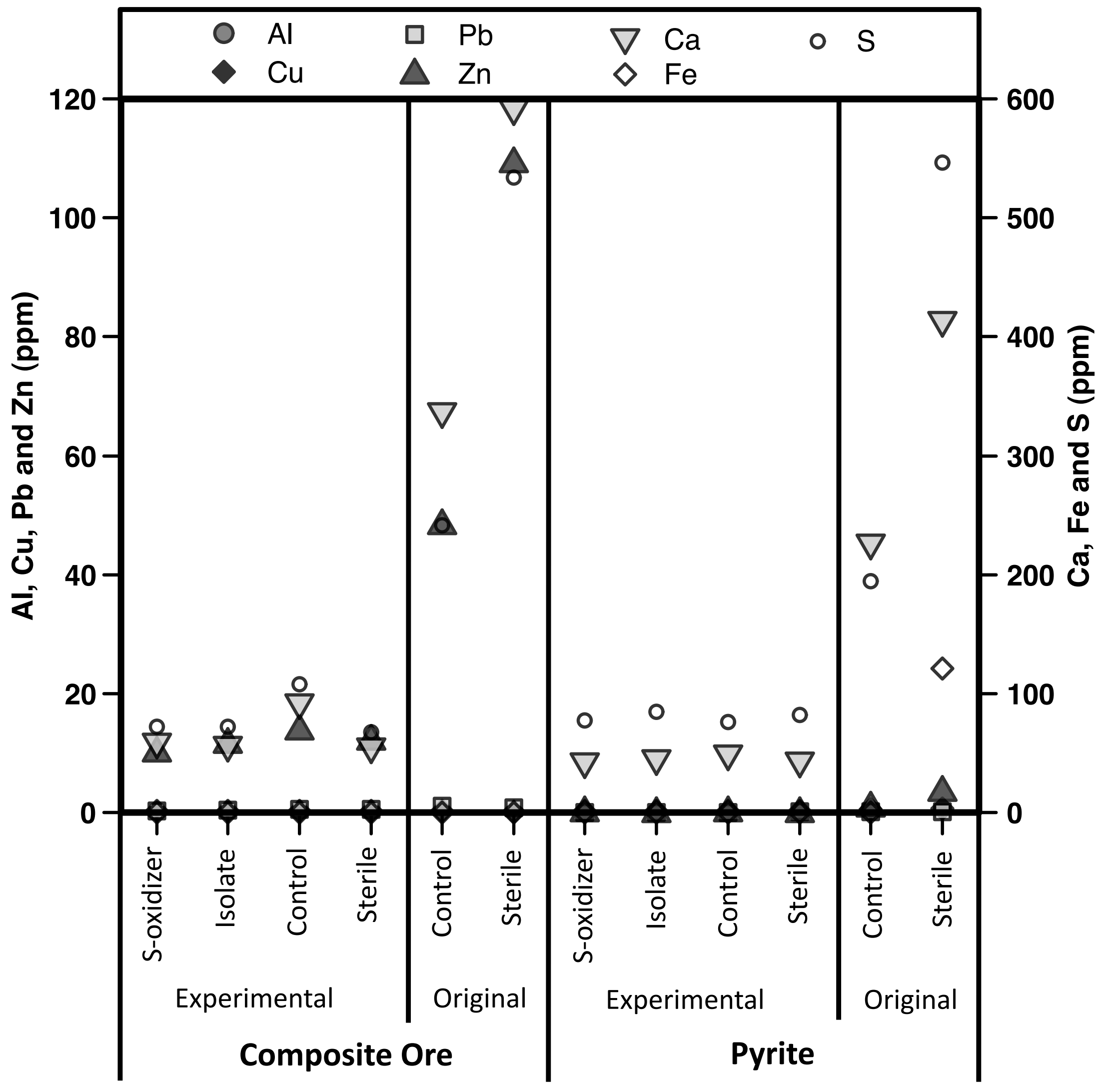



Figure 5: Al, Ca, Cu, Fe, S, Pb and Zn in the MgCl extraction at the termination of the column flow-through experiment. Original control and sterile refers to extractions on material prior to the flow-through experiments, while experimental refers to extractions on the solid materials from the columns at the termination of the experiment.

In the HCl extraction, the major elements Ca, Fe and S were depleted in all experimental columns, relative to the original material. In the ore-only columns Zn was depleted in the inoculated columns only, compared to the original material. This demonstrates that only microbial activity was successful at mobilizing Zn from the ore. Interestingly, Cu was depleted only in the control, both before and after the flow-through experiment. This suggests that both sterilization process and the microbial activity increased Cu cycling. In the MgCl extraction there were no distinct difference between the experimental column results, however all element concentrations in the experimental materials were depleted, relative to the original material. This suggests fluid movement predominantly depleted elemental sorption. From these results, it is clear that the presence of microorganisms increased the metal release and cycling from ore.

## TRIPLE 7 BATCH EXPERIMENT

The batch experiment was completed with the separate materials collected underground from Triple 7 mine. The materials collected included: pyrite/pyrrhotite, Cu stringers, pyrite/sphalerite, pyrrhotite/chalcopyrite, and pyrite. The previous materials are arranged in decreasing metal content. The final batch data presented in Chapter 2 is an average of all these material types, as the columns contained a composite ore, which would include all of the ore types. All material types were completed with a control, inoculated with a culture of the isolate, and inoculated with water collected from the mine. The batch experiments were completed with two different grain sizes, coarse and fine. The coarse grain size contained large pieces, approximately 1-5mm in size, while the fine grain size contained material smaller than 1mm. The batch experiment data was compiled using the fine grain size experiment only (Figure 6). The raw data from all the batch experiment analyses are presented below.

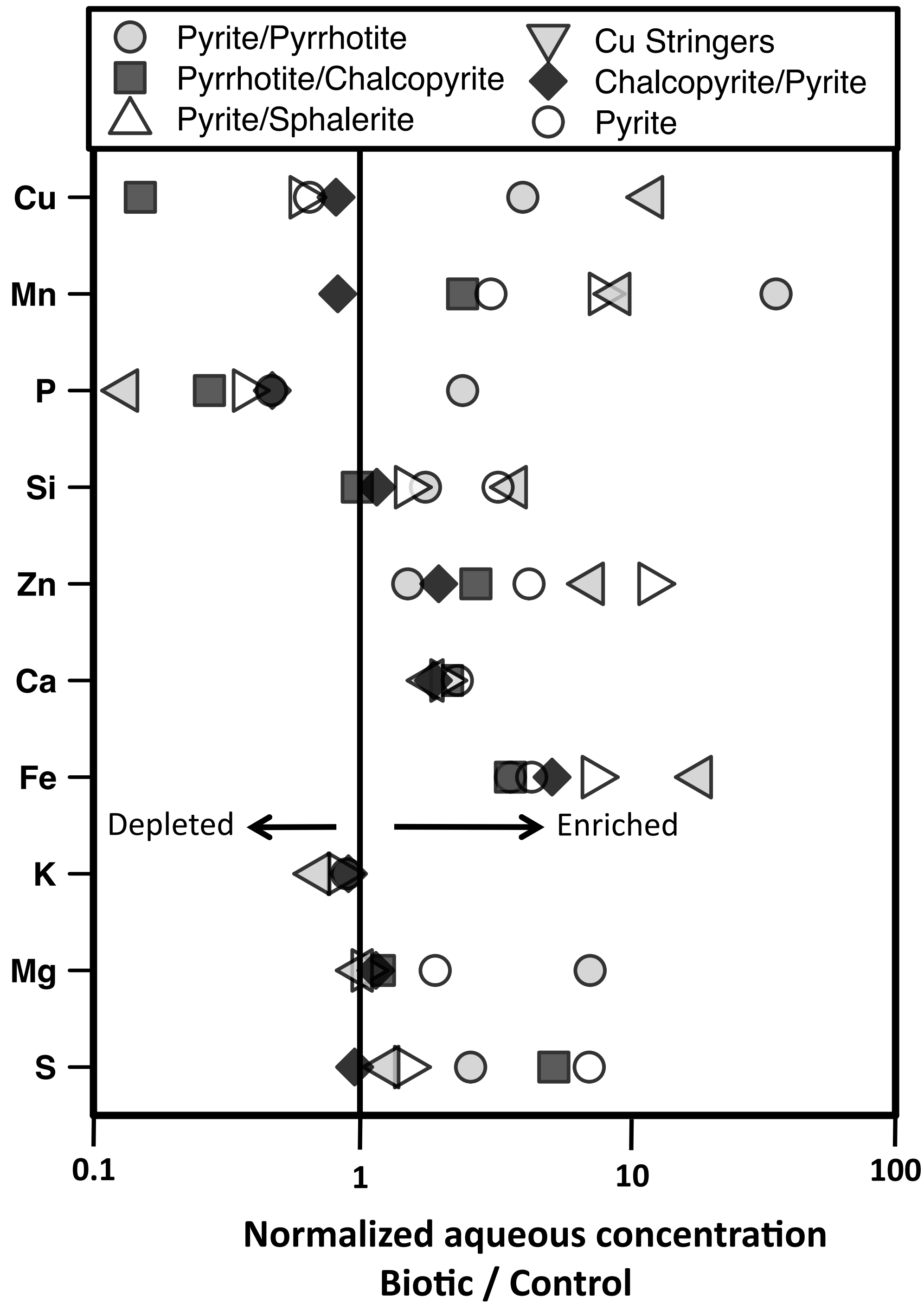


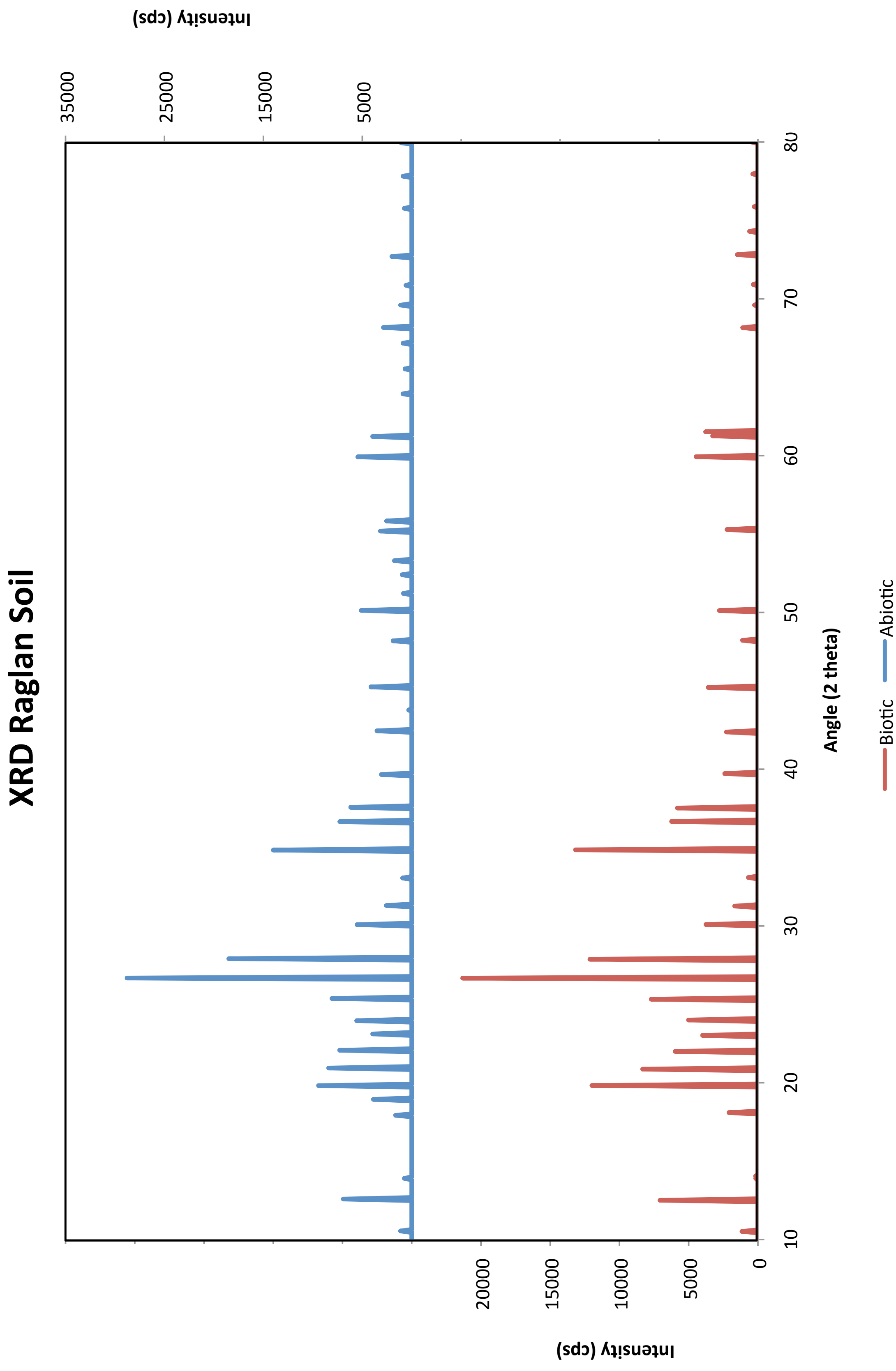

Figure 5: Elemental concentrations in the aqueous phase of the batch experiment. Results are presented as concentration in the inoculated experiment normalized by the concentration in the control.

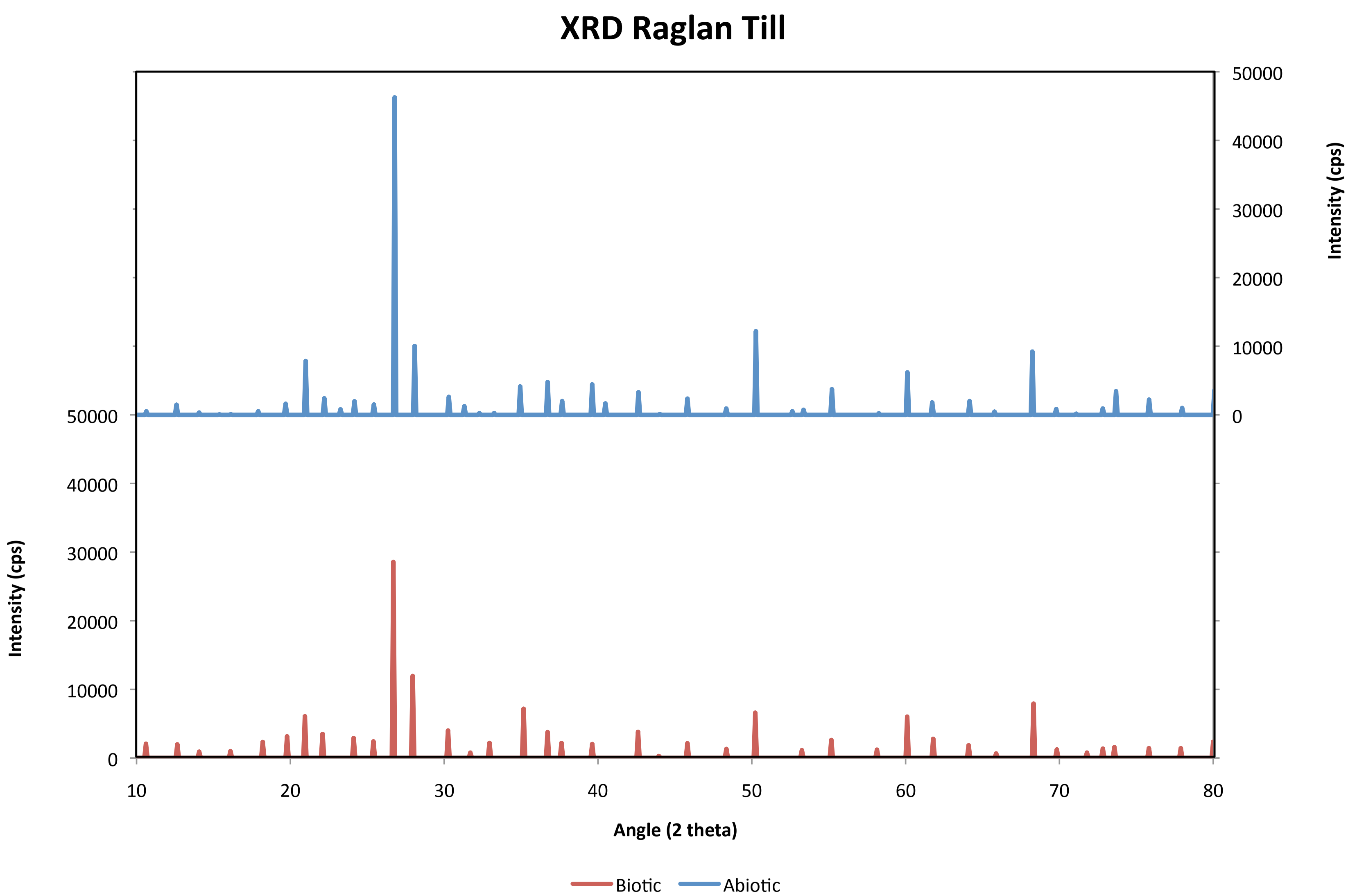
| Material | Grain size | Experiment type | Eh | pH | Ag (ppm) |
|---|---|---|---|---|---|
| Pyrite/Pyrrhotite | Coarse | Sterile | 135 | 6.7 | bdl |
| Pyrite/Pyrrhotite | Coarse | Water | | | bdl |
| Pyrite/Pyrrhotite | Coarse | Culture | 106 | 5.6 | bdl |
| Pyrite/Pyrrhotite | Fine | Sterile | 135 | 6.7 | 0.03 |
| Pyrite/Pyrrhotite | Fine | Water | | | 0.01 |
| Pyrite/Pyrrhotite | Fine | Culture | 143 | 6.3 | bdl |
| Pyrrhotite/Chalcopyrite | Coarse | Sterile | 38 | 6.9 | bdl |
| Pyrrhotite/Chalcopyrite | Coarse | Water | | | bdl |
| Pyrrhotite/Chalcopyrite | Coarse | Culture | 114 | 7.0 | bdl |
| Pyrrhotite/Chalcopyrite | Fine | Sterile | 38 | 6.9 | bdl |
| Pyrrhotite/Chalcopyrite | Fine | Water | | | bdl |
| Pyrrhotite/Chalcopyrite | Fine | Culture | 23 | 6.9 | bdl |
| Pyrite/Sphalerite | Coarse | Sterile | 143 | 7.1 | 0.00 |
| Pyrite/Sphalerite | Coarse | Water | | | bdl |
| Pyrite/Sphalerite | Coarse | Culture | 164 | 6.9 | bdl |
| Pyrite/Sphalerite | Fine | Sterile | 143 | 7.1 | bdl |
| Pyrite/Sphalerite | Fine | Water | | | 0.52 |
| Pyrite/Sphalerite | Fine | Culture | 198 | 6.8 | bdl |
| Cu Stringers | Coarse | Sterile | 170 | 5.9 | 0.01 |
| Cu Stringers | Coarse | Water | | | bdl |
| Cu Stringers | Coarse | Culture | 35 | 5.6 | bdl |
| Cu Stringers | Fine | Sterile | 170 | 5.9 | 0.06 |
| Cu Stringers | Fine | Water | | | bdl |
| Cu Stringers | Fine | Culture | 160 | 5.7 | 0.01 |
| Chalcopyrite/Pyrite | Coarse | Sterile | 185 | 5.9 | bdl |
| Chalcopyrite/Pyrite | Coarse | Water | | | bdl |
| Chalcopyrite/Pyrite | Coarse | Culture | 250 | 6.1 | 0.01 |
| Chalcopyrite/Pyrite | Fine | Sterile | 185 | 5.9 | 0.12 |
| Chalcopyrite/Pyrite | Fine | Water | | | 0.17 |
| Chalcopyrite/Pyrite | Fine | Culture | 80 | 6.0 | bdl |
| Pyrite | Coarse | Sterile | 143 | 6.7 | bdl |
| Pyrite | Coarse | Water | | | bdl |
| Pyrite | Coarse | Culture | 90 | 6.8 | bdl |
| Pyrite | Fine | Sterile | 143 | 6.7 | bdl |
| Pyrite | Fine | Water | | | bdl |
| Pyrite | Fine | Culture | -13 | 6.6 | bdl |
| Media blank | | | | | bdl |
| Mine water blank | | | | | bdl |

| Al (ppm) | As (ppm) | B (ppm) | Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) |
|---|---|---|---|---|---|---|---|
| 0.11 | 0.00 | bdl | 0.18 | 327 | 0.04 | 0.74 | bdl |
| bdl | 0.10 | 68.8 | 1.84 | Sat | 0.04 | 0.31 | bdl |
| 0.12 | bdl | bdl | 0.18 | 173 | 0.04 | 0.77 | bdl |
| 0.04 | 0.00 | bdl | 0.07 | 160 | 0.02 | 0.35 | bdl |
| 0.00 | 0.02 | 32.4 | 0.94 | 386 | 0.04 | 0.58 | bdl |
| bdl | 0.03 | 34.5 | 0.99 | Sat | 0.04 | 0.54 | bdl |
| 0.07 | 0.01 | 4.6 | 0.10 | Sat | 0.00 | 0.79 | bdl |
| bdl | 0.06 | 70.0 | 1.71 | Sat | 0.02 | 0.84 | bdl |
| 0.05 | bdl | 4.4 | 0.11 | 405 | 0.00 | 1.19 | bdl |
| 0.24 | bdl | bdl | 0.10 | 259 | 0.02 | 0.73 | bdl |
| 0.32 | 0.05 | 32.5 | 1.65 | Sat | 0.10 | 0.53 | bdl |
| 0.08 | bdl | bdl | 0.07 | 498 | 0.05 | 0.25 | bdl |
| 0.11 | 0.03 | 4.6 | 0.13 | 140 | 0.05 | 0.00 | bdl |
| bdl | 0.17 | 76.3 | 1.68 | Sat | 0.09 | 0.01 | bdl |
| 0.03 | 0.06 | 3.1 | 0.11 | 273 | 0.02 | 0.00 | bdl |
| 0.09 | 0.04 | 5.1 | 0.13 | 134 | 0.12 | 0.01 | bdl |
| bdl | 0.25 | 83.0 | 1.76 | Sat | 0.20 | 0.02 | bdl |
| 0.07 | 0.16 | 4.1 | 0.09 | 285 | 0.15 | 0.01 | bdl |
| 1.00 | 0.01 | 4.4 | 0.04 | 143 | 0.00 | 0.03 | bdl |
| 4.24 | 0.10 | 76.1 | 1.57 | Sat | 0.00 | 0.13 | bdl |
| 0.54 | bdl | 1.4 | 0.08 | 290 | 0.01 | 0.24 | bdl |
| 5.61 | bdl | bdl | 0.07 | 135 | 0.03 | 0.12 | bdl |
| 10.93 | 0.11 | 55.4 | 1.65 | Sat | 0.05 | 0.12 | bdl |
| 4.42 | bdl | bdl | 0.10 | 282 | 0.03 | 0.11 | bdl |
| 0.64 | 0.00 | bdl | 0.06 | 80 | 0.02 | 0.09 | bdl |
| 1.79 | 0.15 | 71.3 | 1.56 | Sat | 0.02 | 0.10 | bdl |
| 3.31 | 0.00 | 1.7 | 0.05 | 296 | 0.02 | 0.24 | bdl |
| 13.24 | bdl | bdl | 0.04 | 149 | 0.02 | 0.15 | bdl |
| 16.41 | 0.11 | 67.5 | 1.51 | Sat | 0.04 | 0.13 | bdl |
| 1.11 | 0.01 | bdl | 0.06 | 272 | 0.01 | 0.29 | bdl |
| 0.15 | 0.00 | bdl | 0.19 | 196 | 0.03 | 0.00 | bdl |
| bdl | 0.06 | 55.2 | 1.83 | Sat | 0.06 | 0.02 | bdl |
| 0.04 | bdl | bdl | 0.15 | 371 | 0.02 | 0.00 | bdl |
| 2.40 | bdl | bdl | 0.11 | 352 | 0.10 | 0.01 | bdl |
| 0.12 | 0.04 | 14.3 | 1.61 | Sat | 0.12 | 0.02 | bdl |
| 0.12 | bdl | bdl | 0.11 | 513 | 0.08 | 0.01 | bdl |
| 0.07 | bdl | bdl | 0.02 | 224 | 0.02 | 0.01 | bdl |
| bdl | 0.19 | 83.4 | 1.66 | Sat | bdl | 0.01 | bdl |

| Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) | Mg (ppm) | Mn (ppm) | Mo (ppm) | Ni (ppm) |
|---|---|---|---|---|---|---|---|
| 3.72 | 204 | 505 | 0.01 | 77 | 0.4 | bdl | 0.02 |
| 2.26 | 172 | Sat | 0.34 | 913 | 18.1 | bdl | 0.01 |
| 0.57 | 213 | 496 | 0.01 | 79 | 0.4 | bdl | 0.02 |
| 28.65 | 35 | 589 | 0.00 | 83 | 0.3 | bdl | 0.01 |
| 21.77 | 127 | 499 | 0.17 | 447 | 9.4 | bdl | 0.02 |
| 10.91 | 127 | Sat | 0.18 | 598 | 10.2 | bdl | 0.02 |
| 0.40 | 4 | Sat | 0.01 | 68 | 0.3 | bdl | 0.01 |
| 0.27 | 118 | Sat | 0.33 | 894 | 19.1 | bdl | 0.01 |
| 0.72 | 15 | 501 | 0.01 | 77 | 1.4 | bdl | 0.01 |
| 1.96 | 109 | 415 | 0.01 | 72 | 3.2 | bdl | 0.01 |
| 2.51 | 364 | Sat | 0.32 | 886 | 19.0 | bdl | 0.01 |
| 0.00 | 278 | 480 | 0.01 | 80 | 4.8 | bdl | 0.01 |
| 0.07 | 18 | 393 | 0.01 | 59 | 0.2 | bdl | 0.02 |
| 0.10 | 54 | Sat | 0.33 | 862 | 15.7 | bdl | 0.02 |
| 0.05 | 28 | 427 | 0.02 | 69 | 0.5 | bdl | 0.03 |
| 0.03 | 19 | 395 | 0.02 | 59 | 0.3 | bdl | 0.05 |
| 0.34 | 24 | Sat | 0.32 | 858 | 17.0 | bdl | 0.03 |
| 0.10 | 20 | 414 | 0.02 | 69 | 0.7 | bdl | 0.04 |
| 0.53 | 3 | 363 | 0.01 | 52 | 0.2 | bdl | bdl |
| 1.42 | 34 | Sat | 0.32 | 913 | 18.3 | bdl | 0.01 |
| 0.14 | 39 | 420 | 0.01 | 68 | 0.4 | bdl | 0.01 |
| 5.29 | 116 | 372 | 0.01 | 57 | 0.5 | bdl | 0.01 |
| 3.99 | 194 | Sat | 0.34 | 923 | 18.9 | bdl | 0.01 |
| 2.10 | 137 | 385 | 0.01 | 65 | 0.5 | bdl | 0.01 |
| 1.80 | 93 | 199 | 0.00 | 47 | 0.3 | bdl | 0.01 |
| 0.84 | 54 | Sat | 0.31 | 861 | 15.5 | bdl | 0.00 |
| 6.21 | 25 | 406 | 0.01 | 71 | 1.3 | bdl | 0.01 |
| 8.92 | 45 | 403 | 0.01 | 66 | 0.6 | bdl | 0.01 |
| 17.60 | 64 | Sat | 0.31 | 867 | 18.1 | bdl | 0.01 |
| 0.43 | 55 | 419 | 0.01 | 71 | 0.3 | bdl | 0.02 |
| 1.05 | 129 | 472 | 0.01 | 103 | 1.5 | bdl | 0.01 |
| 0.63 | 258 | Sat | 0.33 | 926 | 17.3 | bdl | 0.01 |
| 0.16 | 113 | 471 | 0.01 | 107 | 1.9 | bdl | 0.01 |
| 3.29 | 408 | 477 | 0.01 | 196 | 6.6 | bdl | 0.03 |
| 5.32 | 477 | Sat | 0.33 | 1008 | 28.8 | bdl | 0.03 |
| 0.57 | 387 | 480 | 0.01 | 201 | 6.7 | bdl | 0.02 |
| 0.89 | 89 | 541 | 0.00 | 106 | 2.2 | bdl | 0.02 |
| 0.05 | 1 | Sat | 0.34 | 977 | 19.4 | bdl | bdl |

| P (ppm) | Pb (ppm) | S (ppm) | Se (ppm) | Si (ppm) | Sr (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|---|
| 9.2 | 0.08 | 48 | bdl | 2.4 | 0.12 | 0.10 | 0.66 |
| 0.7 | bdl | 242 | 0.17 | 4.3 | Sat | 0.03 | 1.75 |
| 9.3 | 0.05 | 49 | 0.00 | 2.4 | Sat | 0.05 | 0.71 |
| bdl | 0.11 | 74 | 0.11 | 1.4 | 0.25 | 0.06 | 2.53 |
| bdl | 0.17 | 175 | 0.04 | 2.6 | Sat | 0.03 | 3.79 |
| bdl | 0.20 | 192 | 0.21 | 2.5 | 5.80 | 0.06 | 4.10 |
| 9.2 | 0.04 | 48 | 0.08 | 3.5 | 0.10 | 0.05 | 0.13 |
| 1.8 | bdl | 254 | 0.24 | 3.7 | Sat | 0.02 | 0.33 |
| 9.6 | 0.07 | 51 | 0.03 | 1.9 | 5.67 | 0.05 | 0.19 |
| 4.6 | 0.14 | 121 | 0.05 | 1.6 | 0.16 | 0.06 | 1.37 |
| 0.8 | 0.06 | 268 | 0.08 | 3.5 | Sat | 0.06 | 5.70 |
| 2.3 | 0.05 | 291 | 0.09 | 1.7 | 5.49 | 0.08 | 0.32 |
| 9.1 | 0.46 | 48 | 0.03 | 2.1 | 0.22 | 0.05 | 18.15 |
| 1.5 | 0.83 | 242 | 0.12 | 3.1 | Sat | 0.02 | 30.33 |
| 7.9 | 0.52 | 47 | 0.07 | 1.6 | 5.22 | 0.05 | 6.77 |
| 6.4 | 2.74 | 62 | 0.08 | 2.6 | 0.12 | 0.05 | 48.02 |
| 1.5 | 4.42 | 261 | 0.27 | 4.7 | Sat | 0.03 | 77.43 |
| 5.1 | 3.12 | 70 | 0.07 | 2.3 | 5.59 | 0.05 | 58.18 |
| 4.5 | 0.04 | 38 | 0.07 | 3.3 | 0.08 | 0.06 | 0.07 |
| 0.9 | bdl | 245 | 0.16 | 5.5 | Sat | 0.04 | 0.68 |
| 5.8 | 0.04 | 39 | 0.03 | 5.7 | 5.45 | 0.07 | 0.13 |
| bdl | 0.08 | 66 | 0.13 | 6.0 | 0.10 | 0.11 | 1.28 |
| 0.0 | 0.02 | 268 | 0.27 | 11.2 | Sat | 0.12 | 2.01 |
| 1.6 | 0.09 | 61 | 0.09 | 5.1 | 5.54 | 0.10 | 0.55 |
| 4.9 | 0.02 | 36 | 0.04 | 2.1 | 0.10 | 0.06 | 0.37 |
| 1.2 | 0.06 | 232 | 0.15 | 4.3 | Sat | 0.05 | 0.79 |
| bdl | 0.08 | 76 | 0.12 | 4.0 | 5.04 | 0.09 | 1.47 |
| bdl | 0.13 | 50 | 0.02 | 12.8 | 0.07 | 0.16 | 0.81 |
| bdl | 0.10 | 245 | 0.34 | 13.5 | Sat | 0.13 | 5.56 |
| 5.3 | 0.05 | 43 | bdl | 3.8 | 5.68 | 0.06 | 0.17 |
| 8.7 | 0.10 | 57 | bdl | 2.6 | 0.21 | 0.07 | 1.31 |
| 1.6 | 0.02 | 251 | 0.19 | 4.9 | Sat | 0.04 | 1.25 |
| 6.6 | 0.09 | 62 | 0.04 | 2.2 | 5.76 | 0.07 | 0.16 |
| 4.2 | 0.86 | 111 | 0.04 | 3.7 | 0.24 | 0.10 | 10.10 |
| bdl | 0.85 | 349 | 0.01 | 9.4 | Sat | 0.07 | 5.78 |
| 2.8 | 0.32 | 397 | 0.10 | 5.0 | Sat | 0.09 | 2.50 |
| 6.0 | 0.36 | 56 | 0.02 | 1.6 | 0.15 | 0.06 | 0.59 |
| 1.6 | bdl | 248 | 0.26 | 2.9 | Sat | 0.06 | 0.19 |


XRD Raglan Soil
Intensity (cps)
35000
25000
15000
5000
Intensity (cps)
20000
15000
10000
5000
0
10
20
30
40
50
60
70
80
Angle (2 theta)
Biotic
Abiotic



XRD Raglan Till
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40000
30000
20000
10000
0
Intensity (cps)
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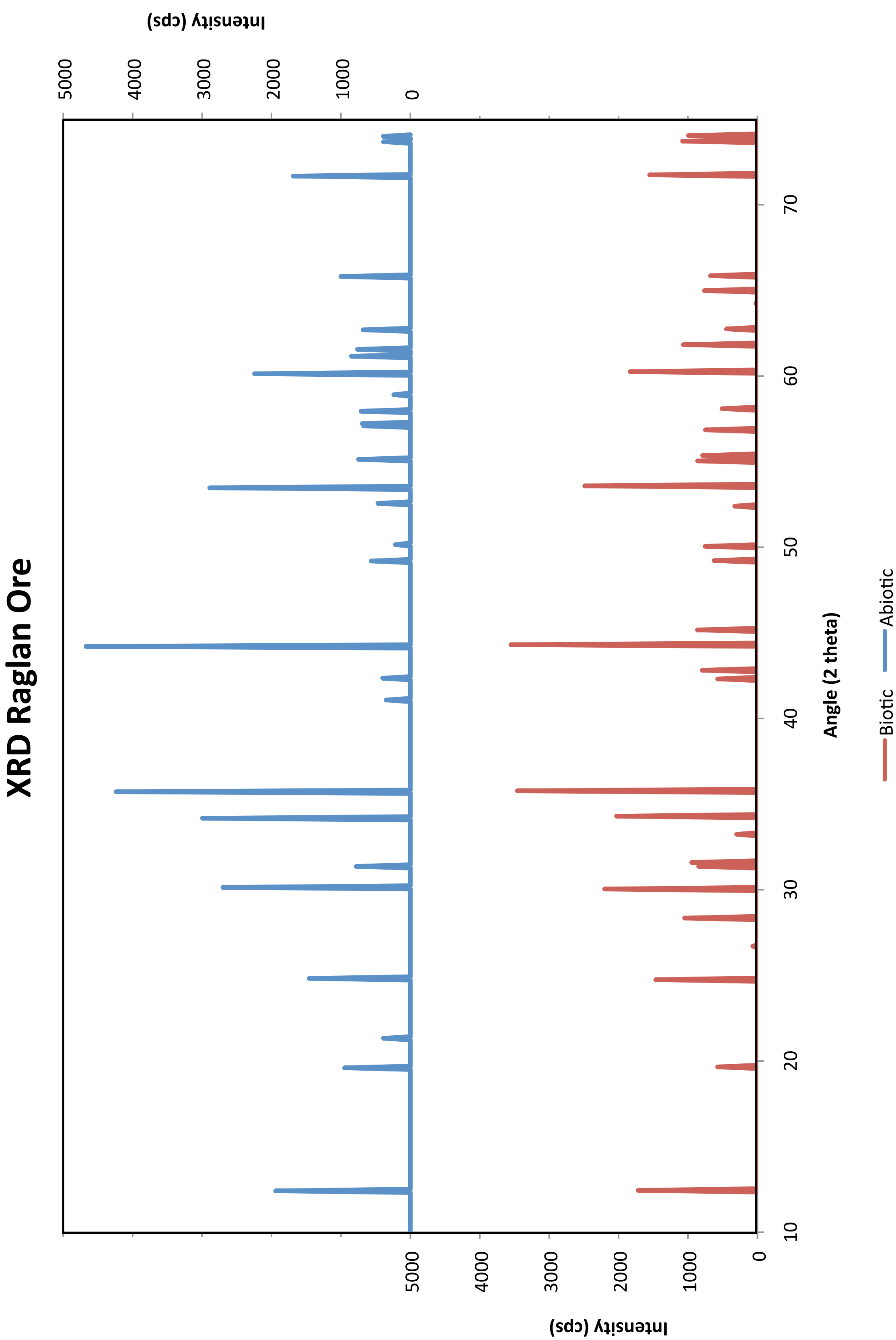
40000
30000
20000
10000
0
10
20
30
40
50
60
70
80
Angle (2 theta)
Biotic
Abiotic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Intensity (cps)
Intensity (cps)
Angle (2 theta)
Biotic
Abiotic
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3000
4000
5000
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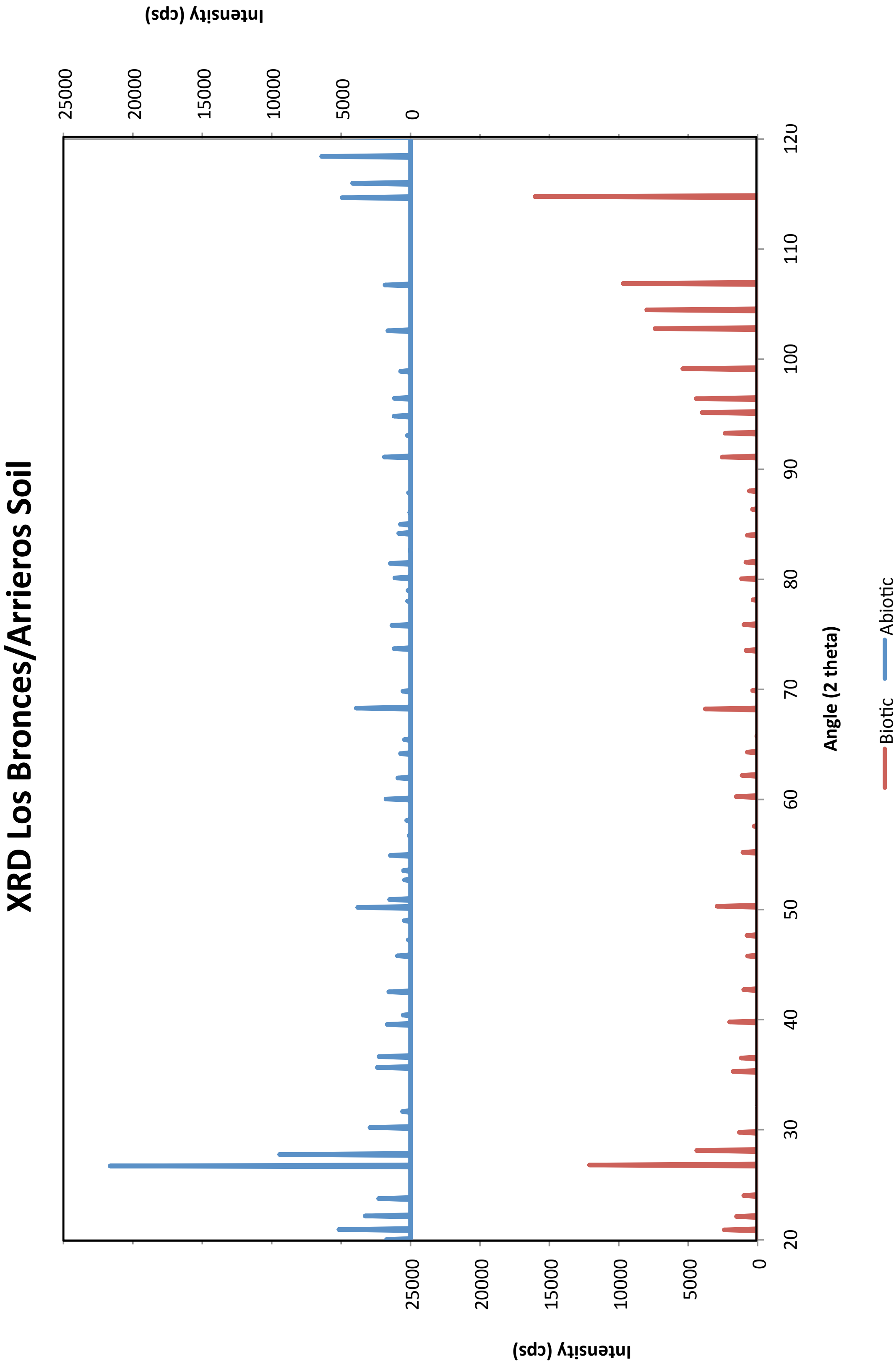
30
40
50
60
70


XRD Los Bronces/Arrieros Soil
Intensity (cps)
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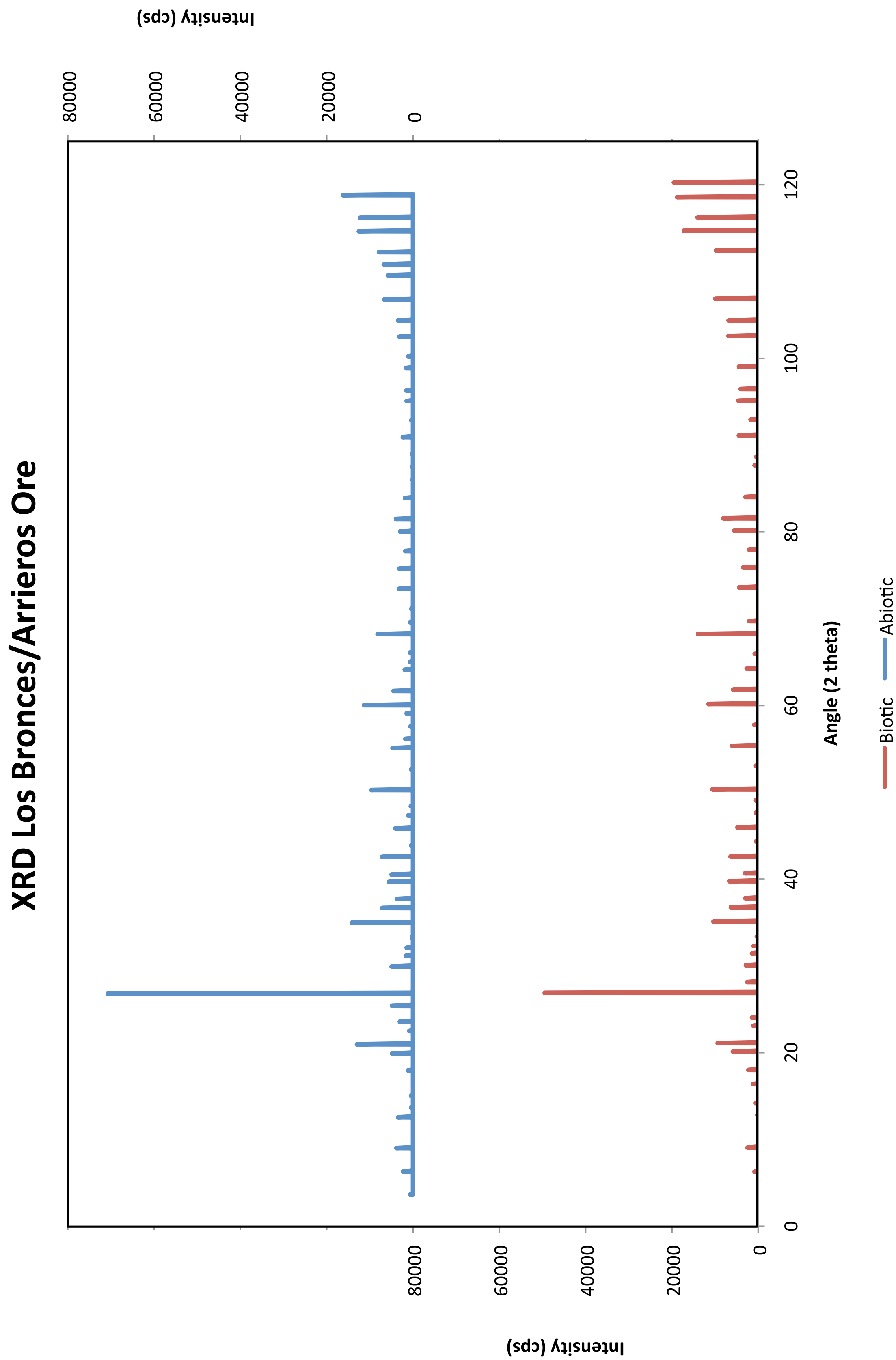
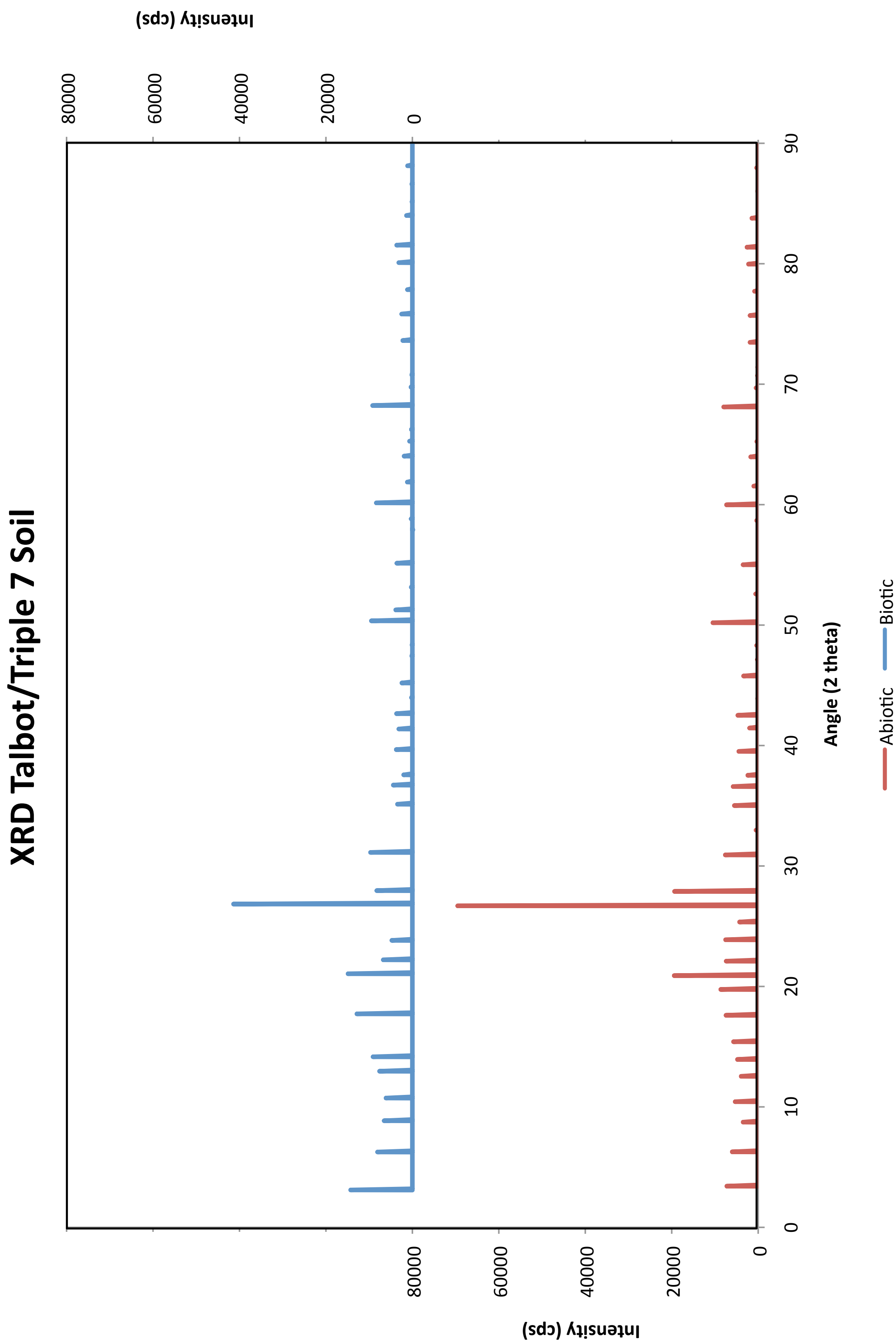
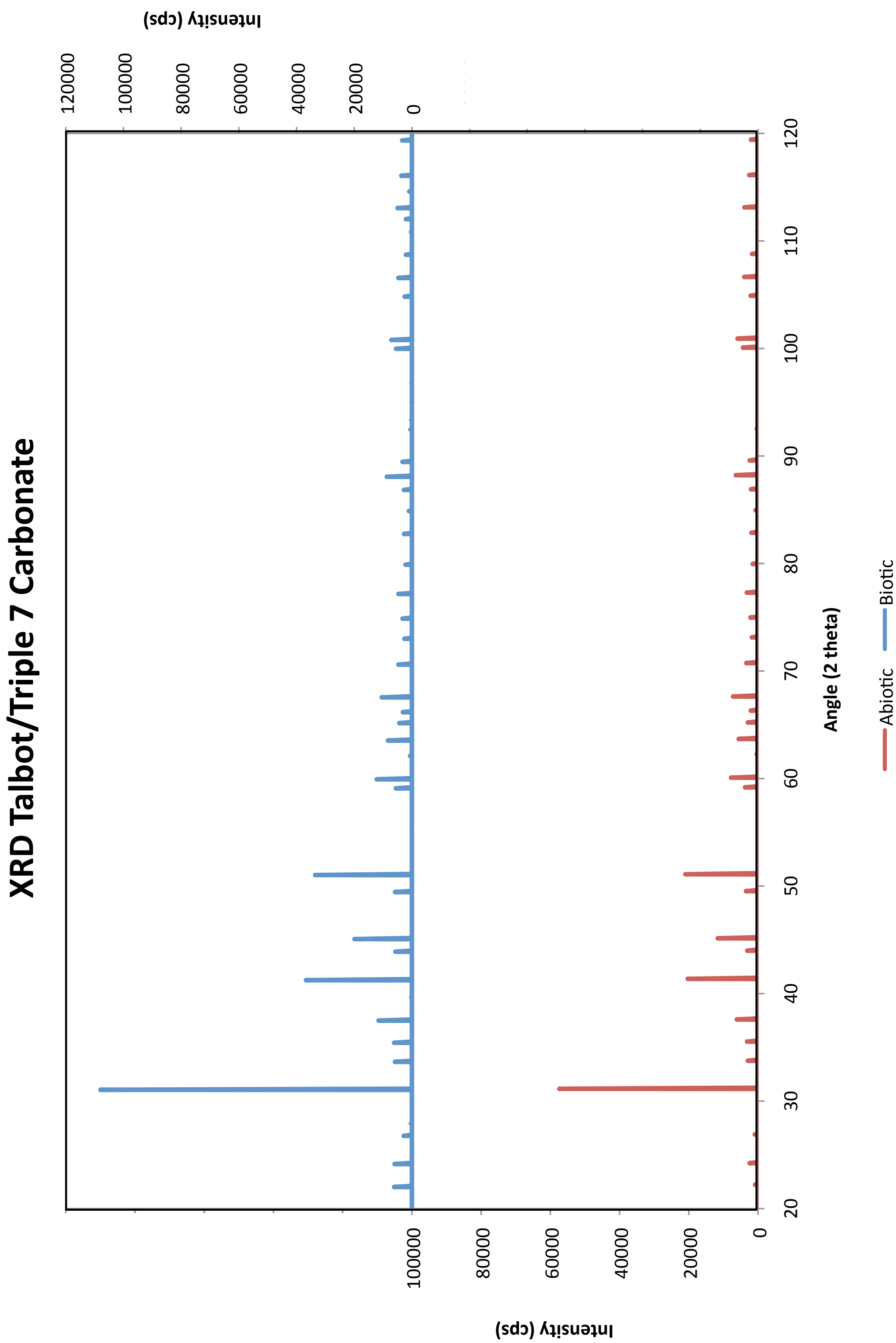
5000
10000
15000
20000
25000
Intensity (cps)
0
5000
10000
15000
20000
25000
20
30
40
50
60
70
80
90
100
110
120
Angle (2 theta)
Biotic
Abiotic


XRD Los Bronces/Arrieros Ore
Intensity (cps)
80000
60000
40000
20000
0
0
20
40
60
80
100
120
Angle (2 theta)
Biotic
Abiotic


XRD Talbot/Triple 7 Soil
Intensity (cps)
80000
60000
40000
20000
0
Angle (2 theta)
0
10
20
30
40
50
60
70
80
90
Abiotic
Biotic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60000
40000
20000
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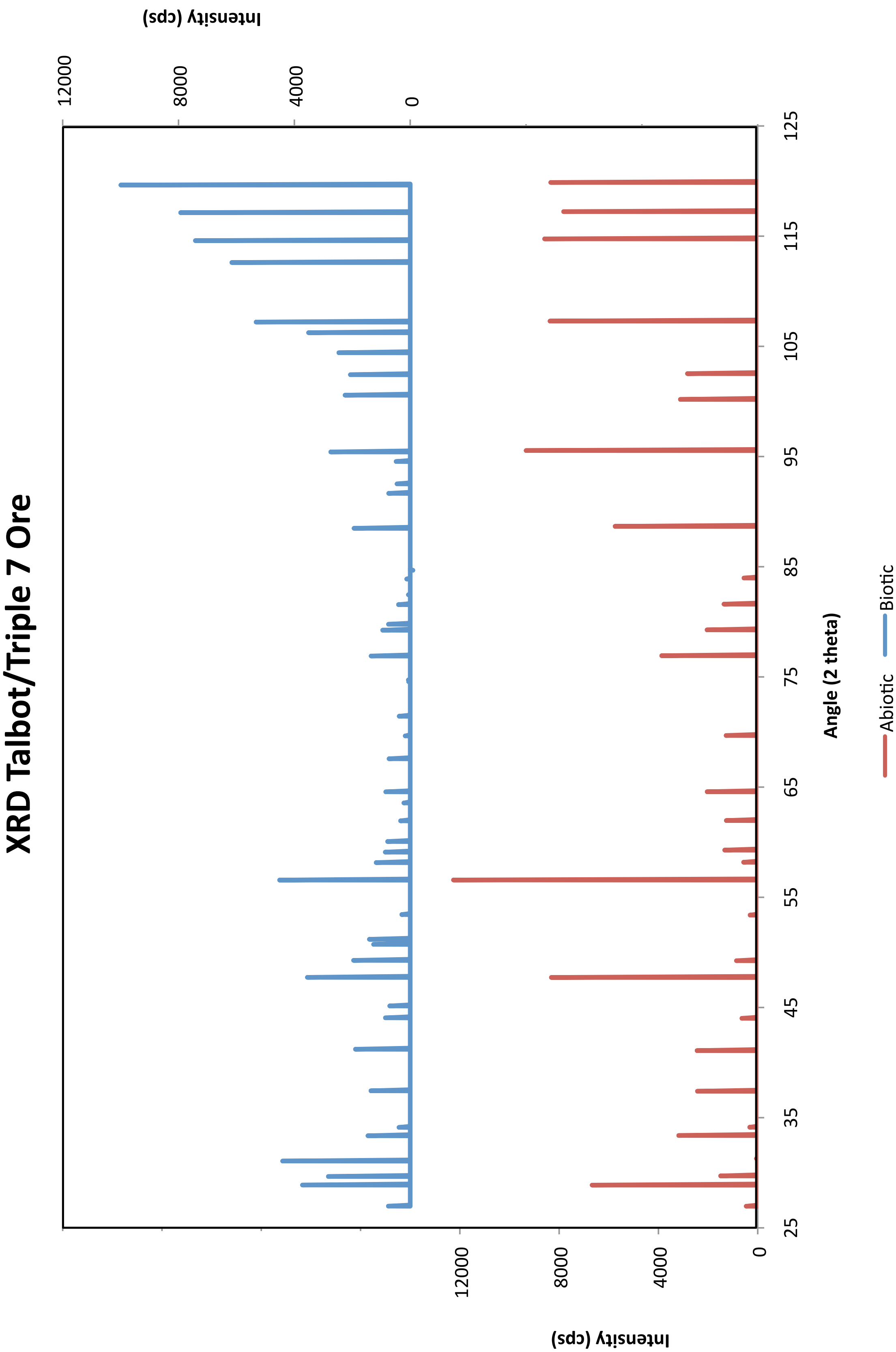
Intensity (cps)
100000
80000
60000
40000
20000
0
20
30
40
50
60
70
80
90
100
110
120
Angle (2 theta)
Abiotic
Biotic


XRD Talbot/Triple 7 Ore
Intensity (cps)
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8000
4000
0
Intensity (cps)
12000
8000
4000
0
25
35
45
55
65
75
85
95
105
115
125
Angle (2 theta)
Abiotic
Biotic

# APPENDIX C. FIELD SAMPLING DATA NOT REPORTED FROM TALBOT PROSPECT AND TRIPLE 7 MINE

In the previous chapters, a microbiological investigation of a buried VMS deposit (Chapter 2) and a biogeochemical survey in soil overlying a VMS deposit (Chapter 3) was reported using results from a sampling event in September, 2008. Previous to that, sampling of ore material was attempted using core acquired at the Talbot prospect. An attempt at completing the biogeochemical survey at the Talbot prospect was undertaken in May 2008, however, due to extenuating circumstances only three sites were sampled. In this appendix, a review of the results from both of these investigations is presented.

In May 2008, a full biogeochemical survey of the soil grid overlying the VMS deposit at Talbot could not be completed, so three sample sites were chosen for analysis. One location was within the geochemical anomaly, and the other two were within the geochemical background area, however, one of these sites was within a topographical depression and was water saturated. The microbial community at these sites was determined using phospholipid fatty acid analysis (PLFA) and DNA clone library determination, previously described in Chapter 3 and Chapter 2, respectively. The total microbial biomass and community composition, as determined by PLFA (Figure 1), demonstrates that the bacterial abundance at the anomalous location is significantly lower than the background locations. Bacterial clone libraries generated from the anomalous (Figure 2) and background (Figure 3) locations does not yield a significant difference in the community composition, with clones related to common soil and denitrifying bacteria. DNA analyses demonstrated that Archaea are only present at the anomalous location (Figure 4), with clones closely related to other clones from extreme environments, such as uranium tailings and hot springs.

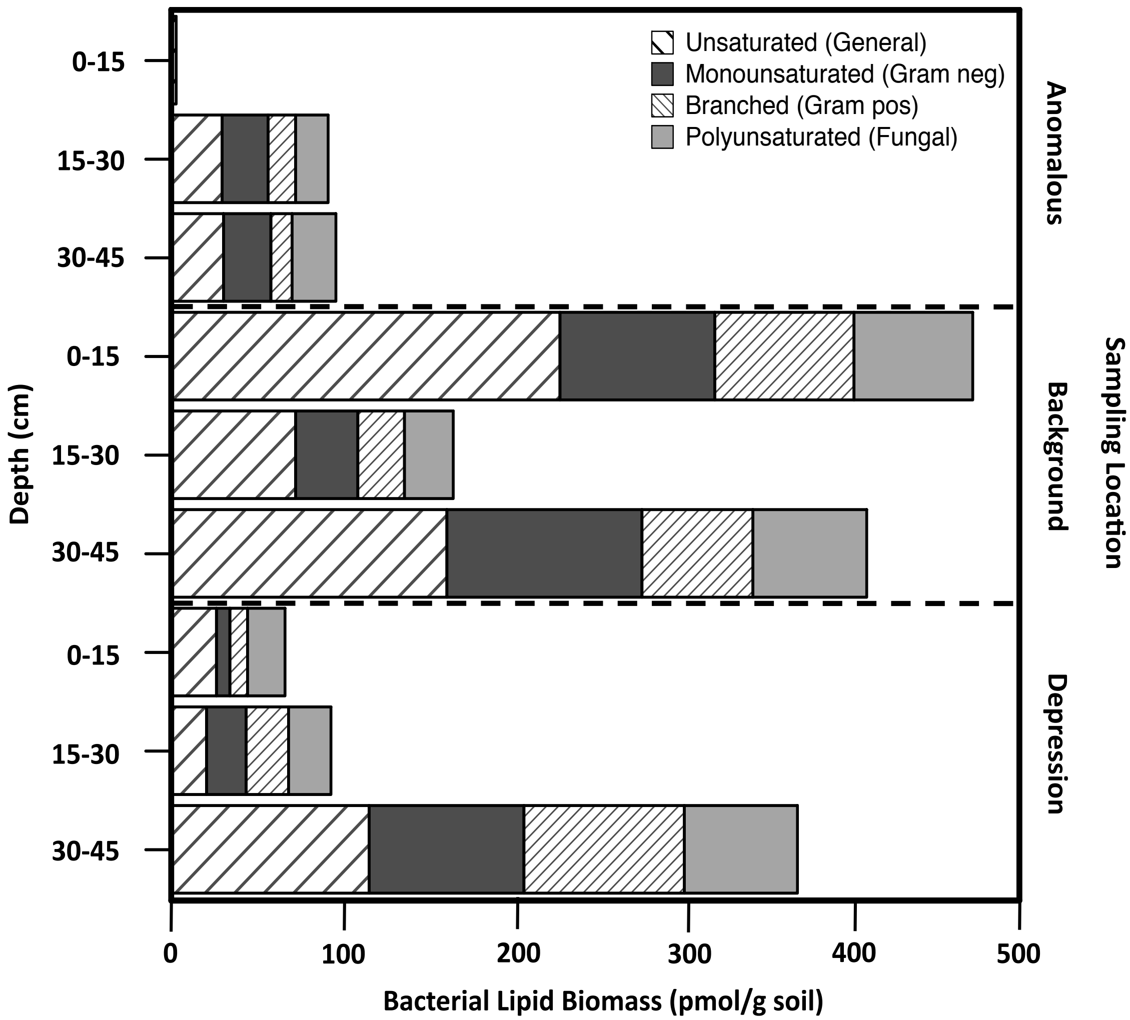


Figure 1: Bacterial community composition at three initial sampling locations.

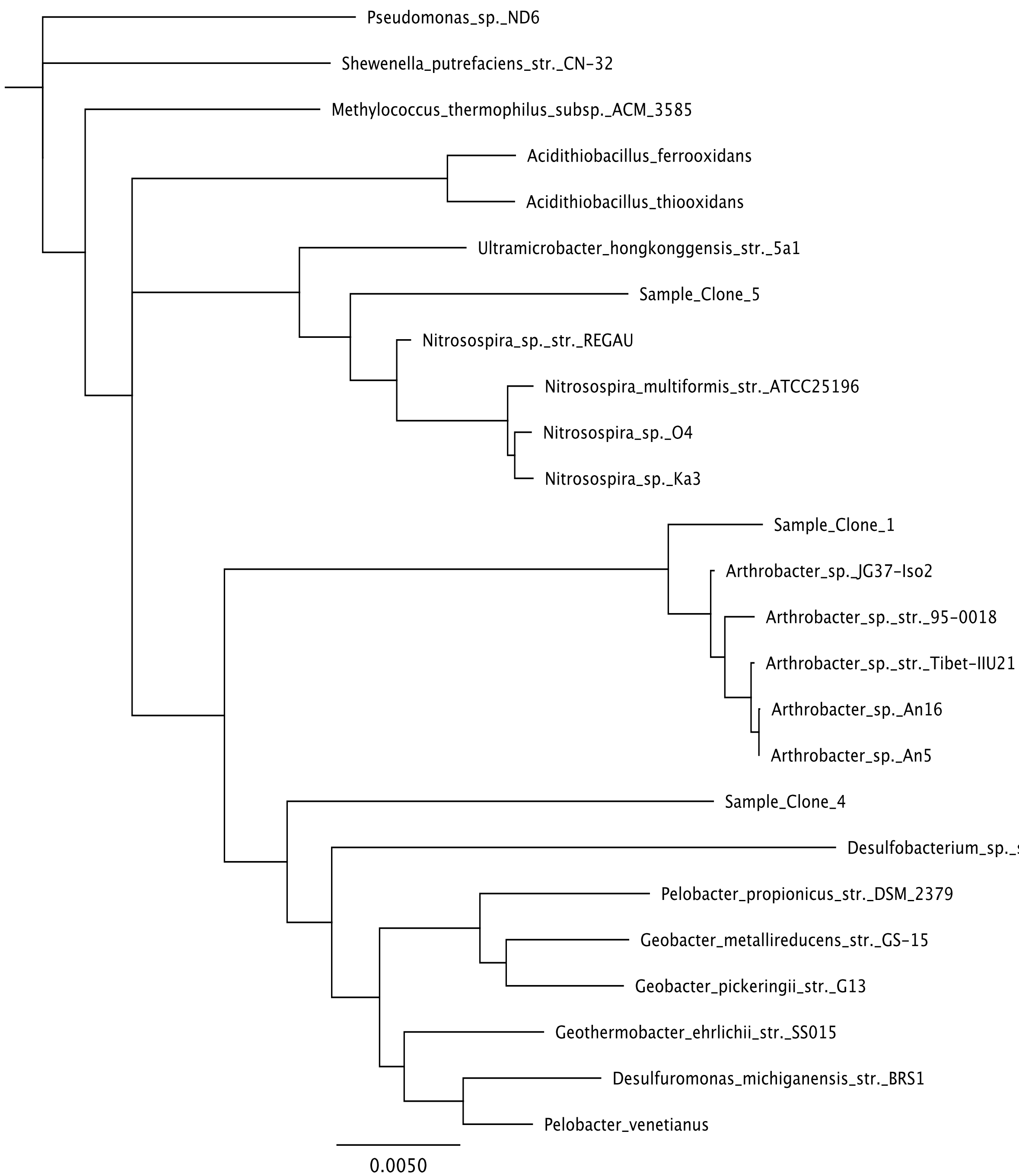


Figure 2: Bacterial sample clones at the anomalous location.

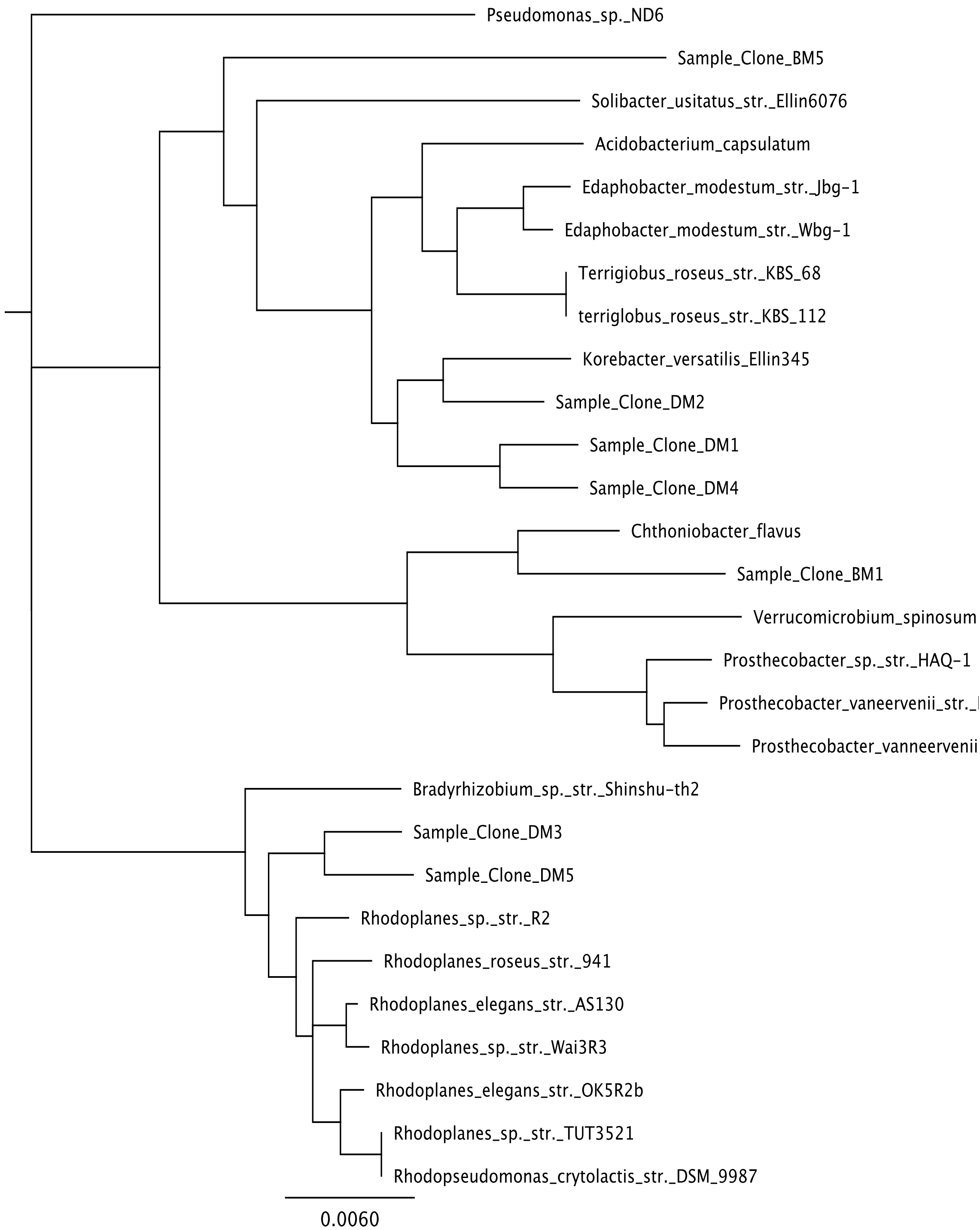


Figure 3: Bacterial sample clones at the background location.

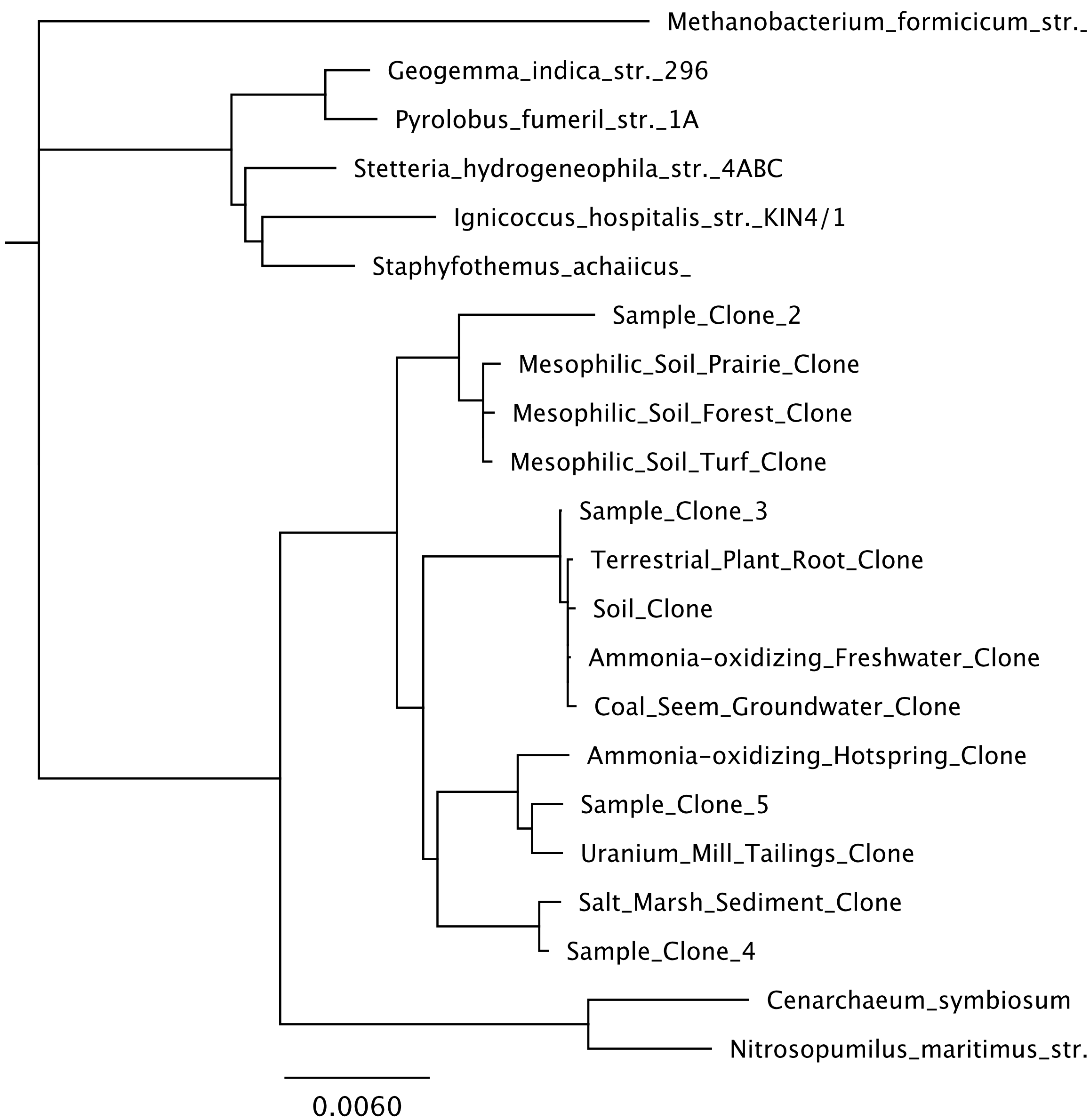


Figure 4: Archaeal sample clones at anomalous location.

As this data was only collected from three sample sites, and is not statistically significant, it was not included in the survey results from Chapter 3. These results did provide preliminary evidence that the microbial community overlying buried mineralization is significantly different when compared to background locations. As these results demonstrated that Archaea were only present over mineralization, molecular analyses were attempted on samples from the Talbot grid survey completed in September 2008. PCR cycles for the amplification of bacterial and Archaeal DNA are listed below (Table 1). Non-specific binding occurred with all samples, even after attempts to optimize the Archaeal PCR were completed. Therefore, Archaeal lipid analysis methods were initiated using previously published results (Fritze et al., 1999; Nichols et al., 1993). The methods were tested with cultures of *Methanobacterium formicicum*. All samples from the Talbot prospect survey grid were found to be below detection for the Archaeal lipid techniques.

Table 1: Thermocycler programs for DNA amplification

**Bacterial PCR cycle**

| | Initial Denaturing | 25 Cycles Denaturing | Annealing | Extension | Final Extension |
|---|---|---|---|---|---|
| **Temperature** | 94°C | 94°C | 55°C | 72°C | 72°C |
| **Time** | 2min | 15sec | 15sec | 45sec | 5min |

**Archaeal PCR cycle**

| | Initial Denaturing | 30 Cycles Denaturing | Annealing | Extension | Final Extension |
|---|---|---|---|---|---|
| **Temperature** | 94°C | 94°C | 45°C | 72°C | 72°C |
| **Time** | 2min | 30sec | 30sec | 90sec | 20min |

To investigate the microbial ecology associated with the buried ore, molecular analyses on core samples from the Talbot prospect were completed using previously documented techniques (Henneberger et al., 2006; Herrera and Cockell, 2007; Hirsch et al., 1995). All analyses yielded the absence of microorganisms in all collected samples. To test the molecular methodology, ore material from Triple 7 was used with cultures of *Escherichia coli.* In brief, 10 g of each ore type was spiked with one colony from plated cultures of *Escherichia coli*, and DNA extractions were completed using the MoBio PowerMax soil DNA kit. The filtrate at the end of the DNA extraction procedure was concentrated using a refrigerated centrifuge. Nested PCR was completed in an attempt to concentrate the resultant PCR product. All ore types resulted in positive amplification when spiked with *Escherichia coli* (Figure 5). This suggests that the implemented molecular techniques for the ore materials were adequate, however as these molecular techniques resulted in negative results for all collected field samples, microbial abundance was below detection.

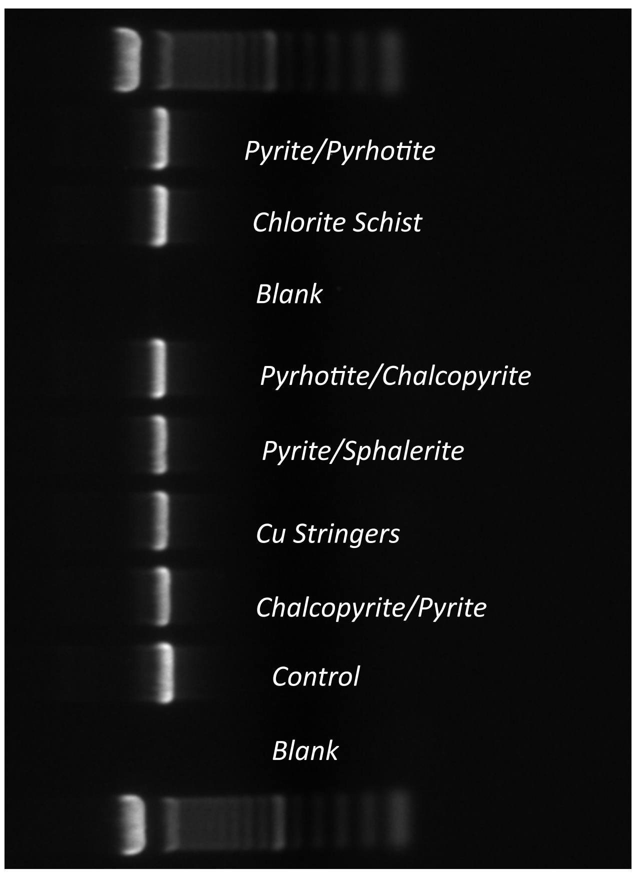


Figure 5: Image of resultant PCR products from ore samples spiked with *Escherichia coli.*

The water that was collected from three boreholes at a depth of 1.4 km from Triple 7 mine was sent to ACME laboratories (Vancouver, Canada) for analysis. As the three boreholes were located within close proximity along the same abandoned tunnel, the results from all boreholes were averaged as duplicates (Table 2).

Table 2: Geochemistry of mine water collected from Triple 7, Flin Flon, Manitoba, Canada.

| | | |
|---|---|---|
| pH | 6.1 | |
| TDS | 5430 | ppm |
| Salinity | 12.6 | % |
| Alkalinity | 3 | ppm |
| TOC | 3 | ppm |
| Conductivity | 6540 | uS/cm |

| Concentration (%) | |
|---|---|
| Ca | 2.5 |
| Cl | 8.0 |
| Mg | 0.14 |
| Na | 2.1 |

| Concentration (ppm) | |
|---|---|
| As | 1.1 |
| B | 2.8 |
| Ba | 1.4 |
| Br | 782 |
| Fe | 1.1 |
| K | 245 |
| Mn | 26 |
| $NO_3$ | 480 |
| S | 240 |
| Se | 3.3 |
| Si | 4.1 |

| Concentration (ppb) | |
|---|---|
| Ag | 12 |
| Al | <100 |
| Au | <5 |
| Be | <5 |
| Bi | <5 |
| Cd | <5 |
| Ce | <1 |
| Co | 12.93 |
| Cr | <50 |
| Cs | 42 |
| Cu | 47 |
| F | 360 |
| Li | 349 |
| Mo | <10 |
| Ni | <20 |
| P | <2000 |
| Pb | <10 |
| Rb | 575 |
| Rh | 5.3 |
| Sn | <5 |
| Sr | 648 |
| Te | 79 |
| Ti | <1000 |
| V | 310 |
| Y | 4.4 |
| Zn | 197 |

REFERENCES


Fritze, H., Tikka, P., Pennanen, T., Saano, A., Jurgens, G., Nilsson, M., Bergman, I., and Kitunen, V., 1999, Detection of Archaeal Diether Lipid by Gas Chromatography from Humus and Peat: Scandinavian Journal for Research, v. 14, p. 545-551.

Henneberger, R.M., Walter, M.R., and Anitori, R.P., 2006, Extraction of DNA from acidic, hydrothermally modified volcanic soils: Environmental chemistry, v. 3, p. 100-104.

Herrera, A., and Cockell, C.S., 2007, Exploring microbial diversity in volcanic environments: A review of methods in DNA extraction: Journal of Microbiological Methods, v. 70, p. 1-12.

Hirsch, P., Eckhardt, F.E.W., and Palmer, R.J., 1995, Methods for the study of rock-inhabiting microorganisms - A mini review: Journal of Microbiological Methods, v. 23, p. 143-167.

Nichols, P.D., Shaw, P.M., Mancuso, C.A., and Franzmann, P.D., 1993, Analysis of archaeal phospholipid-derived di- and tetraether lipids by high temperature capillary gas chromatography: Journal of Microbiological Methods, v. 18, p. 1-9.

# APPENDIX D. MICROBIAL ISOLATION AND CULTURING

## MEDIA RECEIPES FOR ISOLATION AND CULTURING

### ARTIFICAL WATER FOR COLUMN EXPERIMENTS

| | |
|---|---|
| $NaHCO_3$ | 1.0 g |
| $MgCl_2$ | 1.0 g |
| $K_2SO_4$ | 1.0 g |
| $CaCl_2$ | 1.0g |
| NaCl | 1.0 g |
| Na-acetate | 0.25g |
| Na-pyruvate | 0.25 g |
| DL-Na-lactate | 0.25 g |
| Distilled water | 50 L |

## SULFATE REDUCER GROWTH MEDIUM

DSMZ 63. Desulfovibrio medium

Solution A:

| | |
|---|---|
| $K_2HPO_4$ | 0.5 g |
| $NH_4Cl$ | 1.0 g |
| $Na_2SO_4$ | 1.0 g |
| $CaCl_2 \times 2\ H_2O$ | 0.1 g |
| $MgSO_4 \times 7\ H_2O$ | 2.0 g |
| DL-Na-lactate | 2.0 g |
| Yeast extract | 1.0 g |
| Resazurin | 1.0 mg |
| Distilled water | 980.0 ml |

Solution B:

| | |
|---|---|
| $FeSO_4 \times 7\ H_2O$ | 0.5 g |
| Distilled water | 10.0 ml |

Solution C:

| | |
|---|---|
| Na-thioglycolate | 0.1 g |
| Ascorbic acid | 0.1 g |
| Distilled water | 10.0 ml |

Dissolve the ingredients of each solution in the appropriate quantities of water. Bring solution A to the boil for a few minutes, then cool to room temperature while gassing with oxygen-free N2 gas. Add solutions B and C, adjust pH to 7.8 with NaOH, and distribute under N2 in anaerobic tubes. During distribution continuously swirl the medium to keep the grey precipitate suspended. Autoclave 15 min at 121°C.

## METHANOGEN GROWTH MEDIUM

ATCC 1045. Methanobacteria medium

Mineral Solution 1:

| | |
|---|---|
| $K_2HPO_4$ | 6.0 g |
| Distilled water | 1.0 L |

Mineral Solution 2:

| | |
|---|---|
| $KH_2PO_4$ | 6.0 g |
| $(NH_4)2SO_4$ | 6.0 g |
| NaCl | 12.0 g |
| $MgSO_4 . 7H_2O$ | 2.4 g |
| $CaCl_2 . 2H_2O$ | 1.6 g |
| Distilled water | 1.0 L |

Sodium Carbonate Solution:

| | |
|---|---|
| $Na_2CO_3$ | 8.0 g |
| Distilled water | 100.0 ml |

Reducing Agent:
Add 300 mg L-Cysteine . HCl to 10 ml of water and 300 mg $Na_2S . 9H_2O$ to a second 10 ml of water: tube under nitrogen gas. After autoclaving at 121C for 15 minutes under fast exhaust and allowing to cool, mix equal amounts of the cysteine and the sodium sulfide (under nitrogen). The mixture should be clear and can be kept for up to two weeks.

Prepare the complete medium by mixing the above components in the following proportions:

83.5 parts of distilled water
5.0 parts of Mineral Solution 2
2.5 parts of Mineral Solution 1
5.0 parts of 8.0% $Na_2CO_3$ Solution
1.0 part of Wolfe's Mineral Solution (see below)
1.0 part of Wolfe's Vitamin Solution (see below)
2.0 parts of Cysteine-Sulfide Reducing Agent
Resazurin (0.025% solution) 4.0 ml/L

Mix all the ingredients except the Wolfe's Vitamin and Cysteine/$Na_2$ solutions. After autoclaving for 15 minutes, cool under 80% $N_2$, 20% $CO_2$ and add the sterile Wolfe's Vitamin Solution, then Cysteine/$Na_2S$ solution. Adjust pH to 7.2 if necessary and tube anaerobically, aseptically.

Wolfe's Mineral Solution:
Available from ATCC as a sterile ready-to-use liquid (Trace Mineral Supplement, catalog no. MD-TMS.)

| | |
|---|---|
| Nitrilotriacetic acid | 1.5 g |
| $MgSO_4 . 7H_2O$ | 3.0 g |
| $MnSO_4 . H_2O$ | 0.5 g |
| NaCl | 1.0 g |
| $FeSO_4 . 7H_2O$ | 0.1 g |
| $CoCl_2 . 6H_2O$ | 0.1 g |
| $CaCl_2$ | 0.1 g |
| $ZnSO_4 . 7H_2O$ | 0.1 g |
| $CuSO_4 . 5H_2O$ | 0.01 g |
| $AlK(SO_4)_2 . 12H_2O$ | 0.01 g |
| $H_3BO_3$ | 0.01 g |
| $Na_2MoO_4 . 2H2O$ | 0.01 g |
| Distilled water | 1.0 L |

Add nitrilotriacetic acid to approximately 500 ml of water and adjust to pH 6.5 with KOH to dissolve the compound. Bring volume to 1.0 L with remaining water and add remaining compounds one at a time.

Wolfe's Vitamin Solution:
Available from ATCC as a sterile ready-to-use liquid (Vitamin Supplement, catalog no. MD-VS).

| | |
|---|---|
| Biotin | 2.0 mg |
| Folic acid | 2.0 mg |
| Pyridoxine hydrochloride | 10.0 mg |
| Thiamine . HCl | 5.0 mg |
| Riboflavin | 5.0 mg |
| Nicotinic acid | 5.0 mg |
| Calcium D-(+)-pantothenate | 5.0 mg |
| Vitamin B12 | 0.1 mg |
| p-Aminobenzoic acid | 5.0 mg |
| Thioctic acid | 5.0 mg |
| Distilled water | 1.0 L |

Filter-sterilize.

IRON REDUCER GROWTH MEDIUM

GS-15. Geobacter metallireducens medium

Main Solution:

| | |
|---|---|
| $NaHCO_3$ | 2.5g |
| $NH_4Cl$ | 1.5g |
| $NaH_2HPO_4$ | 0.6g |
| KCl | 0.1g |
| Distilled water | 1.0 L |

Vitamin Solution:

| | |
|---|---|
| Biotin | 2.0 mg |
| Folic acid | 2.0 mg |
| Pyridoxine hydrochloride | 10.0 mg |
| Thiamine . HCl | 5.0 mg |
| Riboflavin | 5.0 mg |
| Nicotinic acid | 5.0 mg |
| Calcium D-(+)-pantothenate | 5.0 mg |
| Vitamin B12 | 0.1 mg |
| p-Aminobenzoic acid | 5.0 mg |
| Thioctic acid | 5.0 mg |
| Distilled water | 1.0 L |

Mineral Solution:

| | |
|---|---|
| Nitrilotriacetic acid | 1.5 g |
| $MgSO_4 . 7H_2O$ | 3.0 g |
| $MnSO_4 . H_2O$ | 0.5 g |
| NaCl | 1.0 g |
| $FeSO_4 . 7H_2O$ | 0.1 g |
| $CoCl_2 . 6H_2O$ | 0.1 g |
| $CaCl_2$ | 0.1 g |
| $ZnSO_4 . 7H_2O$ | 0.1 g |
| $CuSO_4 . 5H_2O$ | 0.01 g |
| $AlK(SO_4)_2 . 12H_2O$ | 0.01 g |
| $H_3BO_3$ | 0.01 g |
| $Na_2MoO_4 . 2H2O$ | 0.01 g |
| Distilled water | 1.0 L |

Dissolve Fe(III) citrate to 0.5M in 500mL DI and bring the pH to 7 with 10N NaOH. Well-made Fe(III) citrate will have a reddish hue. A dark brown or green colour suggests too much heating, rapid pH adjustment or acid/light exposure.
To the main solution, add 20-50mM acetate. Add 10mL each of the vitamin and mineral mix. Split the media into tubes, add the Fe(III) citrate and sparge with 80%$N_2$ and 20% $CO_2$. Adjust the final pH to 6.8-7.0, and add 10-50mM HEPES. Seal the tubes under a stream of $N_2/CO_2$ and autoclave for 20 minutes.

SULFUR OXIDIZER (CIRCUM-NEUTRAL) GROWTH MEDIUM

ATCC 125. Thiobacillus thiooxidans medium

| | |
|---|---|
| $(NH_4)_2SO_4$ | 0.2g |
| $MgSO_4$ x 7 $H_2O$ | 0.5g |
| $CaCl_2$ | 0.25g |
| $KH_2PO_4$ | 3.0g |
| $FeSO_4$ | 5.0mg |
| Tap water | 1.0L |

Place 1.0g of powdered sulfur into each dry 250mL Erlenmeyer flask. Autoclave the flasks at 100C for 30 minutes on 3 consecutive days. Prepare and filter-sterilize the above salt solution. Carefully pour 100mL of solution down the side of each flask without wetting the sulfur. The sulfur powder should not "wet", but should float on top of the liquid.

SULFUR OXIDIZER (ACIDOPHILIC) GROWTH MEDIUM

ATCC 2039. Acidithiobacillus ferrooxidans medium

Solution A:

| | |
|---|---|
| $(NH_4)_2SO_4$ | 0.8g |
| $MgSO_4$ x 7 $H_2O$ | 2.0g |
| $K_2HPO_4$ | 0.4g |
| Wolfe's Mineral Solution | 5.0mL |
| Distilled water | 800.0mL |

Adjust pH to 2.3 with $H_2SO_4$, and filter sterilize.

Solution B:

| | |
|---|---|
| $FeSO_4$ | 20.0g |
| Distilled water | 200.0mL |

Stir Solution B to dissolve and quickly filter-sterilize.

Aseptically combine Solutions A and B. (A yellow precipitate is normal; it becomes darker as the iron oxidizes.)

Wolfe's Mineral Solution:
Available from ATCC as a sterile ready-to-use liquid (Trace Mineral Supplement, catalog no. MD-TMS).

| | |
|---|---|
| Nitrilotriacetic acid | 1.5 g |
| $MgSO_4 . 7H_2O$ | 3.0 g |
| $MnSO_4 . H_2O$ | 0.5 g |
| NaCl | 1.0 g |
| $FeSO_4 . 7H_2O$ | 0.1 g |
| $CoCl_2 . 6H_2O$ | 0.1 g |
| $CaCl_2$ | 0.1 g |
| $ZnSO_4 . 7H_2O$ | 0.1 g |
| $CuSO_4 . 5H_2O$ | 0.01 g |
| $AlK(SO_4)_2 . 12H_2O$ | 0.01 g |
| $H_3BO_3$ | 0.01 g |
| $Na_2MoO_4$ . 2H2O | 0.01 g |
| Distilled water | 1.0 L |

Add nitrilotriacetic acid to approximately 500 ml of water and adjust to pH 6.5 with KOH to dissolve the compound. Bring volume to 1.0 L with remaining water and add remaining compounds one at a time.

METHANOTROPH GROWTH MEDIUM

ATCC 1306. Nitrate mineral salts medium (NMS)

Main solution:

| | |
|---|---|
| $MgSO_4 . 7H_2O$ | 1.0g |
| $CaCl_2 . 2H_2O$ | 2.0g |
| $FeNH_4EDTA$ | 4.0mg |
| $KNO_3$ | 1.0g |
| $KH_2PO_4$ | 0.272g |
| $NaH_2HPO_4 . 12H_2O$ | 0.717g |
| Trace element solution | 0.5mL |
| Distilled water | 1.0g |

Adjust pH to 6.8, and distribute to sealed tubes. Sparge with CH4, creating a headspace that is 50% Ch4 and 50% air. Autoclave.

Trace element solution:

| | |
|---|---|
| EDTA | 500.0mg |
| $FeSO_4 . 7H_2O$ | 200.0mg |
| $ZnSO_4 . 7H_2O$ | 10.0mg |
| $MnSO_4 . H_2O$ | 3.0mg |
| $H_3BO_3$ | 30.0mg |
| $CoCl_2 . 6H_2O$ | 20.0mg |
| $CaCl_2 . 2H_2O$ | 1.0mg |
| $NiCl_2 . 6H_2O$ | 2.0mg |
| $Na_2MoO_4$ . 2H2O | 3.0mg |
| Distilled water | 1.0 L |

## IRON-OXIDIZING GROWTH MEDIUM

Artificial salt water:

| | |
|---|---|
| NaCl | 27.5g |
| $MgCl_2 . 6H_2O$ | 5.38g |
| $MgSO_4 . 7H_2O$ | 6.78g |
| KCl | 0.72g |
| $NaHCO_3$ | 0.20g |
| $CaCl_2 . 2H_2O$ | 1.40g |
| $NH_4Cl$ | 1.00g |
| $K_2HPO_4$ | 0.05g |
| KNO3 | 1.00g |
| Distilled water | 1.0 L |

FeS Stock solution:

Heat 300 ml of $H_2O$ to 50°C. Separately pre-weigh 46.2g $FeSO_4$ and 39.6g $NaS_2$. While rapidly stirring, add the $FeSO_4$ followed immediately by the $NaS_2$. A thick black precipitate will form instantly. This mixture is stirred continuously for 2 to 3 minutes. The black FeS sludge is decanted into a narrow mouthed glass bottle (500 ml) that can be stoppered tightly. The bottle is filled to the top with $H_2O$ and capped. The FeS is allowed to settle for several hours and then the overlaying water is decanted and replaced. This procedure is repeated at least five times to wash the FeS. After washing, the pH of the FeS solution should be close to neutrality.

Anaerobic iron-oxidizing nitrate reducers – bottle cultures

Add 1g $KNO_3$ to artificial salt water media. Boil and degas, split into 300mL bottles under $N_2/CO_2$. Add 2mM of FeS stock solution and seal. Flush with $N_2/CO_2$.

Microaerophilic lithotrophs – gradient tubes

The bottom layer contains 1% (w/v) high melt agarose and equal volumes of ASW and FeS. The top layer contains 0.15% (w/v) low melt agarose and ASW. Both layers are autoclaved separately. The bottom layer is poured in glass tubes first, and allowed to cool prior to adding the top layer.

FE-OXIDATION GRADIENT TUBES ANALYSES

Microelectrodes were utilized to measure the depletion of $O_2$ in the gradient tubes, to confirm the enhanced $O_2$ consumption of the isolate at the developing Fe-oxide band (Emerson and Moyer, 1997). Measurements were completed on two gradient tubes inoculated after 6 months, and three gradient tubes inoculated after 3 months (Emerson and Floyd, 2005). Analyses on both sets of gradient tubes included duplicate sterile controls. The experimental setup was described in Chapter 2 (Figure 1), and is briefly described as follows. The working electrode was constructed in the lab, with 100μm gold amalgam (Au/Hg) in a 5 mm glass tube drawn out to a 0.2–0.3 mm tip (Druschel et al., 2008). An Ag/AgCl reference electrode and a platinum counter electrode were placed in the top of the ASW layer, and the working electrode was mounted on a one-axis micromanipulator operated by hand to descend in increments between 0.5 and 2 mm for each sampling point (Druschel et al., 2008). The microelectrode was calibrated with ambient air to indicate percent air saturation of $O_2$, and with a detection limit of approximately 0.1% saturation (Sobolev and Roden, 2001). Voltammetric measurements were conducted with a DLK potentiostat (AIS Instruments, Flemington, NJ, USA), QuadStat, and electronic data recorder (eDAQ, Denistone, Australia). Cyclic voltammetry was performed in triplicate at each sampling point in the profile at 1000mV/s between -0.1 and -0.9V (Druschel et al., 2008). Raw data collected from the analyses are presented below (Table 1).

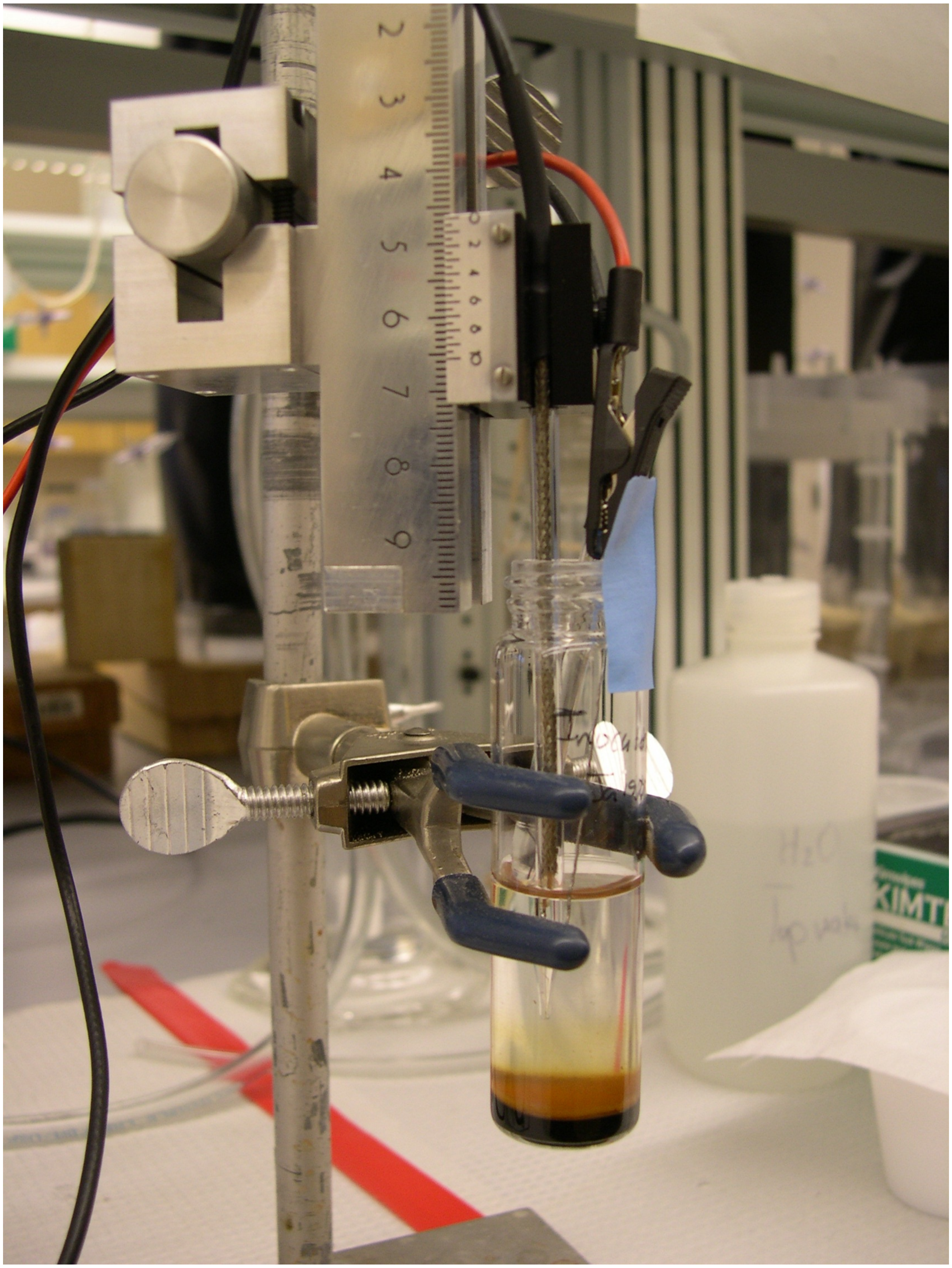


Figure 1: Microelectrode experimental setup for O2 measurement in gradient tubes.

Table 1: $O_2$ measurements on gradient tubes inoculated for 3 months.

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| Std - O2 Sat | 25 | 0.1 | 11.92 | -0.119 | 15.7 | 16.310 | 100 | |
| | 25 | 2.2 | 27.62 | -0.536 | | | | |
| | 26 | 0.1 | 10.04 | -0.119 | 18.02 | | | |
| | 26 | 2.2 | 28.06 | -0.535 | | | | |
| | 27 | 0.1 | 12.03 | -0.119 | 14.93 | | | |
| | 27 | 2.2 | 26.96 | -0.535 | | | | |
| | 28 | 0.1 | 10.2 | -0.119 | 15.21 | | | |
| | 28 | 2.2 | 25.41 | -0.535 | | | | |
| | 29 | 0.1 | 9.27 | -0.119 | 15.46 | | | |
| | 29 | 2.2 | 24.73 | -0.535 | | | | |
| | 30 | 0.1 | 8.57 | -0.119 | 15.97 | | | |
| | 30 | 2.2 | 24.54 | -0.535 | | | | |
| | 31 | 0.1 | 8.61 | -0.119 | 16.25 | | | |
| | 31 | 2.2 | 24.86 | -0.535 | | | | |
| | 32 | 0.1 | 8.02 | -0.119 | 16.36 | | | |
| | 32 | 2.2 | 24.38 | -0.535 | | | | |
| | 33 | 0.1 | 7.45 | -0.119 | 16.84 | | | |
| | 33 | 2.2 | 24.29 | -0.535 | | | | |
| | 34 | 0.1 | 7.04 | -0.119 | 17.2 | | | |
| | 34 | 2.2 | 24.24 | -0.535 | | | | |
| | 35 | 0.1 | 6.75 | -0.119 | 17.47 | | | |
| | 35 | 2.2 | 24.22 | -0.535 | | | | |
| Std - No O2 | 36 | 0.1 | 2.84 | -0.119 | 0.39 | 0.113 | 0 | |
| | 36 | 2.2 | 3.23 | -0.535 | | | | |
| | 37 | 0.1 | 2.77 | -0.119 | -0.31 | | | |
| | 37 | 2.2 | 2.46 | -0.535 | | | | |
| | 38 | 0.1 | 2.66 | -0.119 | -0.29 | | | |
| | 38 | 2.2 | 2.37 | -0.535 | | | | |
| | 39 | 0.1 | 2.57 | -0.119 | -0.25 | | | |
| | 39 | 2.2 | 2.32 | -0.535 | | | | |
| | 40 | 0.1 | 2.52 | -0.119 | -0.23 | | | |
| | 40 | 2.2 | 2.29 | -0.535 | | | | |
| | 41 | 0.1 | 2.46 | -0.119 | -0.18 | | | |
| | 41 | 2.2 | 2.28 | -0.535 | | | | |
| | 42 | 0.1 | 2.43 | -0.119 | -0.07 | | | |
| | 42 | 2.2 | 2.36 | -0.535 | | | | |
| | 43 | 0.1 | 2.39 | -0.119 | -0.11 | | | |
| | 43 | 2.2 | 2.28 | -0.535 | | | | |
| | 44 | 0.1 | 2.36 | -0.119 | -0.09 | | | |
| | 44 | 2.2 | 2.27 | -0.535 | | | | |
| | 45 | 0.1 | 2.34 | -0.119 | -0.08 | | | |
| | 45 | 2.2 | 2.26 | -0.535 | | | | |
| | 46 | 0.1 | 2.32 | -0.119 | -0.07 | | | |
| | 46 | 2.2 | 2.25 | -0.535 | | | | |
| | 47 | 0.1 | 3.17 | -0.119 | 2.12 | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 47 | 2.2 | 5.29 | -0.535 | | | | |
| | 48 | 0.1 | 3.2 | -0.119 | -0.4 | | | |
| | 48 | 2.2 | 2.8 | -0.535 | | | | |
| | 49 | 0.1 | 3.02 | -0.119 | -0.18 | | | |
| | 49 | 2.2 | 2.84 | -0.535 | | | | |
| | 50 | 0.1 | 2.9 | -0.119 | 0.03 | | | |
| | 50 | 2.2 | 2.93 | -0.535 | | | | |
| | 51 | 0.1 | 2.8 | -0.119 | 0.12 | | | |
| | 51 | 2.2 | 2.92 | -0.535 | | | | |
| | 52 | 0.1 | 2.7 | -0.119 | 0.17 | | | |
| | 52 | 2.2 | 2.87 | -0.535 | | | | |
| | 53 | 0.1 | 2.63 | -0.119 | 0.32 | | | |
| | 53 | 2.2 | 2.95 | -0.535 | | | | |
| | 54 | 0.1 | 2.57 | -0.119 | 0.29 | | | |
| | 54 | 2.2 | 2.86 | -0.535 | | | | |
| | 55 | 0.1 | 2.53 | -0.119 | 0.3 | | | |
| | 55 | 2.2 | 2.83 | -0.535 | | | | |
| | 56 | 0.1 | 2.5 | -0.119 | 0.34 | | | |
| | 56 | 2.2 | 2.84 | -0.535 | | | | |
| | 57 | 0.1 | 2.47 | -0.119 | 0.35 | | | |
| | 57 | 2.2 | 2.82 | -0.535 | | | | |
| | 58 | 0.1 | 2.45 | -0.119 | 0.43 | | | |
| | 58 | 2.2 | 2.88 | -0.535 | | | | |
| Sterile - 0cm | 59 | 0.1 | 3.43 | -0.119 | 27 | 17.980 | 74.51 | 199.68 |
| | 59 | 2.2 | 30.43 | -0.535 | | | | |
| | 60 | 0.1 | 6.21 | -0.119 | 21.81 | | | |
| | 60 | 2.2 | 28.02 | -0.536 | | | | |
| | 61 | 0.1 | 7.98 | -0.119 | 17.98 | | | |
| | 61 | 2.2 | 25.96 | -0.536 | | | | |
| Sterile - 2cm | 62 | 0.1 | 4.05 | -0.119 | 25.57 | 15.820 | 62.31 | 166.98 |
| | 62 | 2.2 | 29.62 | -0.536 | | | | |
| | 63 | 0.1 | 8.25 | -0.119 | 17.49 | | | |
| | 63 | 2.2 | 25.74 | -0.536 | | | | |
| | 64 | 0.1 | 8.84 | -0.119 | 15.82 | | | |
| | 64 | 2.2 | 24.66 | -0.536 | | | | |
| Sterile - 4cm | 65 | 0.1 | 5.03 | -0.119 | 22.68 | 14.963 | 55.93 | 149.90 |
| | 65 | 2.2 | 27.71 | -0.536 | | | | |
| | 66 | 0.1 | 8.69 | -0.119 | 15.49 | | | |
| | 66 | 2.2 | 24.18 | -0.536 | | | | |
| | 67 | 0.1 | 9.04 | -0.119 | 14.16 | | | |
| | 67 | 2.2 | 23.2 | -0.536 | | | | |
| | 68 | 0.1 | 8.6 | -0.119 | 15.24 | | | |
| | 68 | 2.2 | 23.84 | -0.536 | | | | |
| Sterile - 6cm | 69 | 0.1 | 7.63 | -0.119 | 16.89 | 13.225 | 49.39 | 132.35 |
| | 69 | 2.2 | 24.52 | -0.536 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 70 | 0.1 | 9.05 | -0.119 | 13.51 | | | |
| | 70 | 2.2 | 22.56 | -0.536 | | | | |
| | 71 | 0.1 | 9.06 | -0.119 | 12.94 | | | |
| | 71 | 2.2 | 22 | -0.536 | | | | |
| Sterile - 8cm | 73 | 0.1 | 6.81 | -0.119 | 17.81 | 12.925 | 48.26 | 129.33 |
| | 73 | 2.2 | 24.62 | -0.536 | | | | |
| | 74 | 0.1 | 8.91 | -0.119 | 13.37 | | | |
| | 74 | 2.2 | 22.28 | -0.536 | | | | |
| | 75 | 0.1 | 9.06 | -0.119 | 12.48 | | | |
| | 75 | 2.2 | 21.54 | -0.536 | | | | |
| Sterile - 10cm | 76 | 0.1 | 7.42 | -0.119 | 15.82 | 12.080 | 45.07 | 120.80 |
| | 76 | 2.2 | 23.24 | -0.536 | | | | |
| | 77 | 0.1 | 8.87 | -0.119 | 12.32 | | | |
| | 77 | 2.2 | 21.19 | -0.536 | | | | |
| | 78 | 0.1 | 8.81 | -0.119 | 11.84 | | | |
| | 78 | 2.2 | 20.65 | -0.536 | | | | |
| Sterile - 12cm | 79 | 0.1 | 6.99 | -0.119 | 14.2 | 10.600 | 39.50 | 105.86 |
| | 79 | 2.2 | 21.19 | -0.536 | | | | |
| | 80 | 0.1 | 8.26 | -0.119 | 10.89 | | | |
| | 80 | 2.2 | 19.15 | -0.536 | | | | |
| | 81 | 0.1 | 8.24 | -0.119 | 10.31 | | | |
| | 81 | 2.2 | 18.55 | -0.536 | | | | |
| Sterile - 14cm | 82 | 0.1 | 7.02 | -0.119 | 12.09 | 9.590 | 35.69 | 95.66 |
| | 82 | 2.2 | 19.11 | -0.536 | | | | |
| | 83 | 0.1 | 7.76 | -0.119 | 9.86 | | | |
| | 83 | 2.2 | 17.62 | -0.536 | | | | |
| | 84 | 0.1 | 7.77 | -0.119 | 9.32 | | | |
| | 84 | 2.2 | 17.09 | -0.536 | | | | |
| Sterile - 16cm | 85 | 0.1 | 6.49 | -0.119 | 10.38 | 8.185 | 30.40 | 81.48 |
| | 85 | 2.2 | 16.87 | -0.536 | | | | |
| | 86 | 0.1 | 7.16 | -0.119 | 8.31 | | | |
| | 86 | 2.2 | 15.47 | -0.536 | | | | |
| | 87 | 0.1 | 7.09 | -0.119 | 8.06 | | | |
| | 87 | 2.2 | 15.15 | -0.536 | | | | |
| Sterile - 18cm | 88 | 0.1 | 6.25 | -0.119 | 9.02 | 7.100 | 26.32 | 70.53 |
| | 88 | 2.2 | 15.27 | -0.536 | | | | |
| | 89 | 0.1 | 6.73 | -0.119 | 7.27 | | | |
| | 89 | 2.2 | 14 | -0.536 | | | | |
| | 90 | 0.1 | 6.68 | -0.119 | 6.93 | | | |
| | 90 | 2.2 | 13.61 | -0.536 | | | | |
| Sterile - 20cm | 91 | 0.1 | 5.69 | -0.119 | 8.34 | 6.275 | 23.21 | 62.20 |
| | 91 | 2.2 | 14.03 | -0.536 | | | | |
| | 92 | 0.1 | 6.24 | -0.119 | 6.49 | | | |
| | 92 | 2.2 | 12.73 | -0.536 | | | | |
| | 93 | 0.1 | 6.24 | -0.119 | 6.06 | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 93 | 2.2 | 12.3 | -0.536 | | | | |
| Sterile - 22cm | 94 | 0.1 | 5.22 | -0.119 | 6.7 | 5.095 | 18.76 | 50.29 |
| | 94 | 2.2 | 11.92 | -0.536 | | | | |
| | 95 | 0.1 | 5.64 | -0.119 | 5.27 | | | |
| | 95 | 2.2 | 10.91 | -0.536 | | | | |
| | 96 | 0.1 | 5.66 | -0.119 | 4.92 | | | |
| | 96 | 2.2 | 10.58 | -0.536 | | | | |
| Sterile - 24cm | 97 | 0.1 | 4.86 | -0.119 | 5.72 | 4.210 | 15.43 | 41.36 |
| | 97 | 2.2 | 10.58 | -0.536 | | | | |
| | 98 | 0.1 | 5.22 | -0.119 | 4.37 | | | |
| | 98 | 2.2 | 9.59 | -0.536 | | | | |
| | 99 | 0.1 | 5.22 | -0.119 | 4.05 | | | |
| | 99 | 2.2 | 9.27 | -0.536 | | | | |
| Sterile - 26cm | 100 | 0.1 | 4.56 | -0.119 | 4.8 | 3.360 | 12.23 | 32.78 |
| | 100 | 2.2 | 9.36 | -0.536 | | | | |
| | 101 | 0.1 | 4.85 | -0.119 | 3.48 | | | |
| | 101 | 2.2 | 8.33 | -0.536 | | | | |
| | 102 | 0.1 | 4.8 | -0.119 | 3.24 | | | |
| | 102 | 2.2 | 8.04 | -0.536 | | | | |
| Sterile - 28cm | 103 | 0.1 | 4.2 | -0.119 | 4.18 | 2.780 | 10.05 | 26.92 |
| | 103 | 2.2 | 8.38 | -0.536 | | | | |
| | 104 | 0.1 | 4.53 | -0.119 | 2.87 | | | |
| | 104 | 2.2 | 7.4 | -0.536 | | | | |
| | 105 | 0.1 | 4.44 | -0.119 | 2.69 | | | |
| | 105 | 2.2 | 7.13 | -0.536 | | | | |
| Sterile - 30cm | 106 | 0.1 | 3.81 | -0.119 | 3.3 | 1.915 | 6.79 | 18.19 |
| | 106 | 2.2 | 7.11 | -0.536 | | | | |
| | 107 | 0.1 | 4.09 | -0.119 | 2.02 | | | |
| | 107 | 2.2 | 6.11 | -0.536 | | | | |
| | 108 | 0.1 | 4.03 | -0.119 | 1.81 | | | |
| | 108 | 2.2 | 5.84 | -0.536 | | | | |
| Sterile - 32cm | 109 | 0.1 | 3.36 | -0.119 | 2.61 | 1.265 | 4.34 | 11.63 |
| | 109 | 2.2 | 5.97 | -0.536 | | | | |
| | 110 | 0.1 | 3.68 | -0.119 | 1.35 | | | |
| | 110 | 2.2 | 5.03 | -0.536 | | | | |
| | 111 | 0.1 | 3.61 | -0.119 | 1.18 | | | |
| | 111 | 2.2 | 4.79 | -0.536 | | | | |
| Sterile - 34cm | 112 | 0.1 | 3.05 | -0.119 | 1.58 | 0.595 | 1.82 | 4.87 |
| | 112 | 2.2 | 4.63 | -0.536 | | | | |
| | 113 | 0.1 | 3.29 | -0.119 | 0.63 | | | |
| | 113 | 2.2 | 3.92 | -0.536 | | | | |
| | 114 | 0.1 | 3.26 | -0.119 | 0.56 | | | |
| | 114 | 2.2 | 3.82 | -0.536 | | | | |
| Std - No O2 | 116 | 0.1 | 3.64 | -0.118 | 2.48 | 1.393 | 0 | |
| | 116 | 0.7 | 6.12 | -0.238 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 117 | 0.1 | 3.53 | -0.118 | 1.73 | | | |
| | 117 | 0.7 | 5.26 | -0.238 | | | | |
| | 118 | 0.1 | 3.41 | -0.118 | 1.48 | | | |
| | 118 | 0.7 | 4.89 | -0.238 | | | | |
| | 119 | 0.1 | 3.34 | -0.118 | 1.25 | | | |
| | 119 | 0.7 | 4.59 | -0.238 | | | | |
| | 120 | 0.1 | 3.26 | -0.118 | 1.11 | | | |
| | 120 | 0.7 | 4.37 | -0.238 | | | | |
| Std - O2 Sat | 121 | 0.1 | 11.46 | -0.118 | 16.39 | 11.088 | 100 | |
| | 121 | 0.7 | 27.85 | -0.238 | | | | |
| | 122 | 0.1 | 12.69 | -0.118 | 14 | | | |
| | 122 | 0.7 | 26.69 | -0.238 | | | | |
| | 123 | 0.1 | 14.37 | -0.118 | 10.43 | | | |
| | 123 | 0.7 | 24.8 | -0.238 | | | | |
| | 124 | 0.1 | 13.09 | -0.118 | 10.16 | | | |
| | 124 | 0.7 | 23.25 | -0.238 | | | | |
| | 125 | 0.1 | 11.99 | -0.118 | 10.35 | | | |
| | 125 | 0.7 | 22.34 | -0.238 | | | | |
| | 126 | 0.1 | 11.03 | -0.118 | 10.01 | | | |
| | 126 | 0.7 | 21.04 | -0.238 | | | | |
| | 127 | 0.1 | 10.45 | -0.118 | 9.95 | | | |
| | 127 | 0.7 | 20.4 | -0.238 | | | | |
| | 128 | 0.1 | 10.14 | -0.118 | 10.07 | | | |
| | 128 | 0.7 | 20.21 | -0.238 | | | | |
| | 129 | 0.1 | 9.63 | -0.118 | 9.77 | | | |
| | 129 | 0.7 | 19.4 | -0.238 | | | | |
| | 130 | 0.1 | 9.4 | -0.118 | 9.75 | | | |
| | 130 | 0.7 | 19.15 | -0.238 | | | | |
| Inoc - 0cm | 168 | 0.1 | 5.47 | -0.118 | 4.05 | 3.760 | 25.70 | 64.25 |
| | 168 | 0.7 | 9.52 | -0.238 | | | | |
| | 169 | 0.1 | 5.5 | -0.118 | 3.47 | | | |
| | 169 | 0.7 | 8.97 | -0.238 | | | | |
| Inoc - 1cm | 170 | 0.1 | 5.06 | -0.118 | 3.61 | 3.163 | 18.40 | 46.01 |
| | 170 | 0.7 | 8.67 | -0.238 | | | | |
| | 171 | 0.1 | 4.96 | -0.118 | 3.05 | | | |
| | 171 | 0.7 | 8.01 | -0.238 | | | | |
| | 172 | 0.1 | 4.9 | -0.118 | 2.83 | | | |
| | 172 | 0.7 | 7.73 | -0.238 | | | | |
| Inoc - 2cm | 173 | 0.1 | 4.72 | -0.118 | 3.37 | 2.833 | 15.68 | 39.21 |
| | 173 | 0.7 | 8.09 | -0.238 | | | | |
| | 174 | 0.1 | 4.58 | -0.118 | 2.66 | | | |
| | 174 | 0.7 | 7.24 | -0.238 | | | | |
| | 175 | 0.1 | 4.49 | -0.118 | 2.47 | | | |
| | 175 | 0.7 | 6.96 | -0.238 | | | | |
| Inoc - 3cm | 176 | 0.1 | 4.38 | -0.118 | 3.45 | 2.783 | 13.53 | 33.82 |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 176 | 0.7 | 7.83 | -0.238 | | | | |
| | 177 | 0.1 | 4.22 | -0.118 | 2.53 | | | |
| | 177 | 0.7 | 6.75 | -0.238 | | | | |
| | 178 | 0.1 | 4.13 | -0.118 | 2.37 | | | |
| Inoc - 4cm | 178 | 0.7 | 6.5 | -0.238 | | | | |
| | 179 | 0.1 | 4.04 | -0.118 | 3.46 | 2.757 | 11.51 | 28.76 |
| | 179 | 0.7 | 7.5 | -0.238 | | | | |
| | 180 | 0.1 | 3.89 | -0.118 | 2.55 | | | |
| | 180 | 0.7 | 6.44 | -0.238 | | | | |
| | 181 | 0.1 | 3.82 | -0.118 | 2.26 | | | |
| | 181 | 0.7 | 6.08 | -0.238 | | | | |
| Inoc - 5cm | 182 | 0.1 | 3.8 | -0.118 | 3.63 | 2.797 | 9.35 | 23.37 |
| | 182 | 0.7 | 7.43 | -0.238 | | | | |
| | 183 | 0.1 | 3.61 | -0.118 | 2.53 | | | |
| | 183 | 0.7 | 6.14 | -0.238 | | | | |
| | 184 | 0.1 | 3.54 | -0.118 | 2.23 | | | |
| | 184 | 0.7 | 5.77 | -0.238 | | | | |
| Inoc - 7cm | 185 | 0.1 | 3.45 | -0.118 | 3.89 | 3.050 | 7.56 | 18.89 |
| | 185 | 0.7 | 7.34 | -0.238 | | | | |
| | 186 | 0.1 | 3.29 | -0.118 | 2.79 | | | |
| | 186 | 0.7 | 6.08 | -0.238 | | | | |
| | 187 | 0.1 | 3.21 | -0.118 | 2.47 | | | |
| | 187 | 0.7 | 5.68 | -0.238 | | | | |
| Inoc - 9cm | 188 | 0.1 | 3.17 | -0.118 | 5.76 | 4.260 | 6.47 | 16.17 |
| | 188 | 0.7 | 8.93 | -0.238 | | | | |
| | 189 | 0.1 | 2.99 | -0.118 | 3.66 | | | |
| | 189 | 0.7 | 6.65 | -0.238 | | | | |
| | 190 | 0.1 | 2.93 | -0.118 | 3.36 | | | |
| | 190 | 0.7 | 6.29 | -0.238 | | | | |
| Inoc -11cm | 193 | 0.1 | 2.56 | -0.118 | 4.15 | 4.270 | 5.02 | 12.55 |
| | 193 | 0.7 | 6.71 | -0.238 | | | | |
| | 194 | 0.1 | 2.56 | -0.118 | 4.16 | | | |
| | 194 | 0.7 | 6.72 | -0.238 | | | | |
| | 195 | 0.1 | 2.55 | -0.118 | 4.5 | | | |
| | 195 | 0.7 | 7.05 | -0.238 | | | | |
| Inoc - 13cm | 198 | 0.1 | 2.17 | -0.118 | 1.52 | 3.530 | 4.37 | 10.92 |
| | 198 | 0.7 | 3.69 | -0.238 | | | | |
| | 199 | 0.1 | 2.23 | -0.118 | 4.29 | | | |
| | 199 | 0.7 | 6.52 | -0.238 | | | | |
| | 200 | 0.1 | 2.23 | -0.118 | 4.78 | | | |
| | 200 | 0.7 | 7.01 | -0.238 | | | | |
| Inoc - 15cm | 202 | 0.1 | 2.1 | -0.118 | 1.37 | 3.467 | 4.79 | 11.97 |
| | 202 | 0.7 | 3.47 | -0.238 | | | | |
| | 203 | 0.1 | 2.17 | -0.118 | 4.49 | | | |
| | 203 | 0.7 | 6.66 | -0.238 | | | | |
| | 204 | 0.1 | 2.14 | -0.118 | 4.54 | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 204 | 0.7 | 6.68 | -0.238 | | | | |
| Inoc -17cm | 206 | 0.1 | 2.06 | -0.118 | 1.5 | 3.510 | 5.23 | 13.07 |
| | 206 | 0.7 | 3.56 | -0.238 | | | | |
| | 207 | 0.1 | 2.11 | -0.118 | 4.38 | | | |
| | 207 | 0.7 | 6.49 | -0.238 | | | | |
| | 208 | 0.1 | 2.11 | -0.118 | 4.65 | | | |
| | 208 | 0.7 | 6.76 | -0.238 | | | | |
| Inoc - 18cm | 210 | 0.1 | 2.02 | -0.118 | 1.94 | 3.910 | 5.61 | 14.02 |
| | 210 | 0.7 | 3.96 | -0.238 | | | | |
| | 211 | 0.1 | 2.09 | -0.118 | 4.56 | | | |
| | 211 | 0.7 | 6.65 | -0.238 | | | | |
| | 212 | 0.1 | 2.1 | -0.118 | 5.23 | | | |
| Inoc - 19cm | 212 | 0.7 | 7.33 | -0.238 | | | | |
| | 214 | 0.1 | 2.02 | -0.118 | 2 | 3.883 | 5.91 | 14.79 |
| | 214 | 0.7 | 4.02 | -0.238 | | | | |
| | 215 | 0.1 | 2.08 | -0.118 | 4.78 | | | |
| | 215 | 0.7 | 6.86 | -0.238 | | | | |
| | 216 | 0.1 | 2.06 | -0.118 | 4.87 | | | |
| | 216 | 0.7 | 6.93 | -0.238 | | | | |
| Inoc - 20cm | 218 | 0.1 | 2.04 | -0.118 | 1.74 | 3.803 | 6.03 | 15.07 |
| | 218 | 0.7 | 3.78 | -0.238 | | | | |
| | 219 | 0.1 | 2.08 | -0.118 | 4.67 | | | |
| | 219 | 0.7 | 6.75 | -0.238 | | | | |
| | 220 | 0.1 | 2.07 | -0.118 | 5 | | | |
| | 220 | 0.7 | 7.07 | -0.238 | | | | |
| Inoc - 21cm | 222 | 0.1 | 2 | -0.118 | 2.24 | 4.167 | 6.43 | 16.08 |
| | 222 | 0.7 | 4.24 | -0.238 | | | | |
| | 223 | 0.1 | 2.05 | -0.118 | 4.77 | | | |
| | 223 | 0.7 | 6.82 | -0.238 | | | | |
| | 224 | 0.1 | 2.07 | -0.118 | 5.49 | | | |
| | 224 | 0.7 | 7.56 | -0.238 | | | | |
| Inoc - 22cm | 226 | 0.1 | 1.98 | -0.118 | 2.32 | 6.460 | 5.95 | 14.88 |
| | 226 | 0.7 | 4.3 | -0.238 | | | | |
| | 227 | 0.1 | 2.04 | -0.118 | 5.08 | | | |
| | 227 | 0.7 | 7.12 | -0.238 | | | | |
| | 235 | 0.1 | 124.27 | -0.118 | 11.98 | | | |
| | 235 | 0.7 | 136.25 | -0.238 | | | | |
| Inoc - 23cm | 236 | 0.1 | 116.68 | -0.118 | 10.29 | 11.270 | 0.69 | 1.72 |
| | 236 | 0.7 | 126.97 | -0.238 | | | | |
| | 237 | 0.1 | 113.65 | -0.118 | 11.46 | | | |
| | 237 | 0.7 | 125.11 | -0.238 | | | | |
| | 238 | 0.1 | 94.66 | -0.118 | 12.06 | | | |
| | 238 | 0.7 | 106.72 | -0.238 | | | | |
| Inoc - 24cm | 239 | 0.1 | 95.99 | -0.118 | 12.63 | 11.960 | 0.69 | 1.72 |
| | 239 | 0.7 | 108.62 | -0.238 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 240 | 0.1 | 75.17 | -0.118 | 12.1 | | | |
| | 240 | 0.7 | 87.27 | -0.238 | | | | |
| | 242 | 0.1 | 22.11 | -0.118 | 11.15 | | | |
| | 242 | 0.7 | 33.26 | -0.238 | | | | |
| Std - No O2 | 116 | 0.1 | 3.64 | -0.118 | -0.09 | -0.072 | 0 | |
| | 116 | 2.8 | 3.55 | -0.649 | | | | |
| | 117 | 0.1 | 3.53 | -0.118 | -0.17 | | | |
| | 117 | 2.8 | 3.36 | -0.649 | | | | |
| | 118 | 0.1 | 3.41 | -0.118 | 0.02 | | | |
| | 118 | 2.8 | 3.43 | -0.649 | | | | |
| | 119 | 0.1 | 3.34 | -0.118 | -0.08 | | | |
| | 119 | 2.8 | 3.26 | -0.649 | | | | |
| | 120 | 0.1 | 3.26 | -0.118 | -0.04 | | | |
| | 120 | 2.8 | 3.22 | -0.649 | | | | |
| Std - O2 Sat | 121 | 0.1 | 11.46 | -0.118 | 16.08 | 13.056 | 100 | |
| | 121 | 2.8 | 27.54 | -0.649 | | | | |
| | 122 | 0.1 | 12.69 | -0.118 | 12.85 | | | |
| | 122 | 2.8 | 25.54 | -0.649 | | | | |
| | 123 | 0.1 | 14.37 | -0.118 | 10.62 | | | |
| | 123 | 2.8 | 24.99 | -0.649 | | | | |
| | 124 | 0.1 | 13.09 | -0.118 | 11.17 | | | |
| | 124 | 2.8 | 24.26 | -0.649 | | | | |
| | 125 | 0.1 | 11.99 | -0.118 | 12.03 | | | |
| | 125 | 2.8 | 24.02 | -0.649 | | | | |
| | 126 | 0.1 | 11.03 | -0.118 | 12.73 | | | |
| | 126 | 2.8 | 23.76 | -0.649 | | | | |
| | 127 | 0.1 | 10.45 | -0.118 | 13.25 | | | |
| | 127 | 2.8 | 23.7 | -0.649 | | | | |
| | 128 | 0.1 | 10.14 | -0.118 | 13.62 | | | |
| | 128 | 2.8 | 23.76 | -0.649 | | | | |
| | 129 | 0.1 | 9.63 | -0.118 | 13.99 | | | |
| | 129 | 2.8 | 23.62 | -0.649 | | | | |
| | 130 | 0.1 | 9.4 | -0.118 | 14.22 | | | |
| | 130 | 2.7 | 23.62 | -0.644 | | | | |
| Inoc - 0cm | 168 | 0.1 | 5.47 | -0.118 | 2.64 | 2.400 | 15.93 | 42.70 |
| | 168 | 2.8 | 8.11 | -0.651 | | | | |
| | 169 | 0.1 | 5.5 | -0.118 | 2.16 | | | |
| | 169 | 2.8 | 7.66 | -0.651 | | | | |
| Inoc - 1cm | 170 | 0.1 | 5.06 | -0.118 | 2.38 | 1.540 | 11.41 | 30.58 |
| | 170 | 2.8 | 7.44 | -0.651 | | | | |
| | 171 | 0.1 | 4.96 | -0.118 | 1.58 | | | |
| | 171 | 2.8 | 6.54 | -0.651 | | | | |
| | 172 | 0.1 | 4.9 | -0.118 | 1.5 | | | |
| | 172 | 2.8 | 6.4 | -0.651 | | | | |
| Inoc - 2cm | 173 | 0.1 | 4.72 | -0.118 | 1.72 | 1.250 | 9.72 | 26.06 |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 173 | 2.8 | 6.44 | -0.651 | | | | |
| | 174 | 0.1 | 4.58 | -0.118 | 1.27 | | | |
| | 174 | 2.8 | 5.85 | -0.651 | | | | |
| | 175 | 0.1 | 4.49 | -0.118 | 1.23 | | | |
| | 175 | 2.8 | 5.72 | -0.651 | | | | |
| Inoc - 3cm | 176 | 0.1 | 4.38 | -0.118 | 1.5 | 1.115 | 8.39 | 22.48 |
| | 176 | 2.8 | 5.88 | -0.651 | | | | |
| | 177 | 0.1 | 4.22 | -0.118 | 1.12 | | | |
| | 177 | 2.8 | 5.34 | -0.651 | | | | |
| | 178 | 0.1 | 4.13 | -0.118 | 1.11 | | | |
| Inoc - 4cm | 178 | 2.8 | 5.24 | -0.651 | | | | |
| | 179 | 0.1 | 4.04 | -0.118 | 1.29 | 0.995 | 7.13 | 19.12 |
| | 179 | 2.8 | 5.33 | -0.651 | | | | |
| | 180 | 0.1 | 3.89 | -0.118 | 1.03 | | | |
| | 180 | 2.8 | 4.92 | -0.651 | | | | |
| | 181 | 0.1 | 3.82 | -0.118 | 0.96 | | | |
| | 181 | 2.8 | 4.78 | -0.651 | | | | |
| Inoc - 5cm | 182 | 0.1 | 3.8 | -0.118 | 1.09 | 0.835 | 5.80 | 15.53 |
| | 182 | 2.8 | 4.89 | -0.651 | | | | |
| | 183 | 0.1 | 3.61 | -0.118 | 0.87 | | | |
| | 183 | 2.8 | 4.48 | -0.651 | | | | |
| | 184 | 0.1 | 3.54 | -0.118 | 0.8 | | | |
| | 184 | 2.8 | 4.34 | -0.651 | | | | |
| Inoc - 7cm | 185 | 0.1 | 3.45 | -0.118 | 0.93 | 0.705 | 4.68 | 12.55 |
| | 185 | 2.8 | 4.38 | -0.651 | | | | |
| | 186 | 0.1 | 3.29 | -0.118 | 0.74 | | | |
| | 186 | 2.8 | 4.03 | -0.651 | | | | |
| | 187 | 0.1 | 3.21 | -0.118 | 0.67 | | | |
| | 187 | 2.8 | 3.88 | -0.651 | | | | |
| Inoc - 9cm | 188 | 0.1 | 3.17 | -0.118 | 2.01 | 0.715 | 4.01 | 10.75 |
| | 188 | 2.8 | 5.18 | -0.651 | | | | |
| | 189 | 0.1 | 2.99 | -0.118 | 0.78 | | | |
| | 189 | 2.8 | 3.77 | -0.651 | | | | |
| | 190 | 0.1 | 2.93 | -0.118 | 0.65 | | | |
| | 190 | 2.8 | 3.58 | -0.651 | | | | |
| Inoc -11cm | 193 | 0.1 | 2.56 | -0.118 | 0.8 | 0.630 | 3.11 | 8.34 |
| | 193 | 2.8 | 3.36 | -0.649 | | | | |
| | 194 | 0.1 | 2.56 | -0.118 | 0.58 | | | |
| | 194 | 2.8 | 3.14 | -0.649 | | | | |
| | 195 | 0.1 | 2.55 | -0.118 | 0.68 | | | |
| | 195 | 2.8 | 3.23 | -0.649 | | | | |
| Inoc - 13cm | 198 | 0.1 | 2.17 | -0.118 | 0.33 | 0.910 | 2.71 | 7.26 |
| | 198 | 2.8 | 2.5 | -0.649 | | | | |
| | 199 | 0.1 | 2.23 | -0.118 | 0.71 | | | |
| | 199 | 2.8 | 2.94 | -0.649 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 200 | 0.1 | 2.23 | -0.118 | 1.11 | | | |
| | 200 | 2.8 | 3.34 | -0.649 | | | | |
| Inoc - 15cm | 202 | 0.1 | 2.1 | -0.118 | 0.43 | 1.295 | 2.97 | 7.96 |
| | 202 | 2.8 | 2.53 | -0.649 | | | | |
| | 203 | 0.1 | 2.17 | -0.118 | 1.03 | | | |
| | 203 | 2.8 | 3.2 | -0.649 | | | | |
| | 204 | 0.1 | 2.14 | -0.118 | 1.56 | | | |
| | 204 | 2.8 | 3.7 | -0.649 | | | | |
| Inoc -17cm | 206 | 0.1 | 2.06 | -0.118 | 0.53 | 1.685 | 3.24 | 8.69 |
| | 206 | 2.8 | 2.59 | -0.649 | | | | |
| | 207 | 0.1 | 2.11 | -0.118 | 1.3 | | | |
| | 207 | 2.8 | 3.41 | -0.649 | | | | |
| | 208 | 0.1 | 2.11 | -0.118 | 2.07 | | | |
| | 208 | 2.8 | 4.18 | -0.649 | | | | |
| Inoc - 18cm | 210 | 0.1 | 2.02 | -0.118 | 0.69 | 2.540 | 3.48 | 9.32 |
| | 210 | 2.8 | 2.71 | -0.649 | | | | |
| | 211 | 0.1 | 2.09 | -0.118 | 1.84 | | | |
| | 211 | 2.8 | 3.93 | -0.649 | | | | |
| | 212 | 0.1 | 2.1 | -0.118 | 3.24 | | | |
| Inoc - 19cm | 212 | 2.8 | 5.34 | -0.649 | | | | |
| | 214 | 0.1 | 2.02 | -0.118 | 0.77 | 2.885 | 3.67 | 9.83 |
| | 214 | 2.8 | 2.79 | -0.649 | | | | |
| | 215 | 0.1 | 2.08 | -0.118 | 2.27 | | | |
| | 215 | 2.8 | 4.35 | -0.649 | | | | |
| | 216 | 0.1 | 2.06 | -0.118 | 3.5 | | | |
| | 216 | 2.8 | 5.56 | -0.649 | | | | |
| Inoc - 20cm | 218 | 0.1 | 2.04 | -0.118 | 0.76 | 3.250 | 3.74 | 10.02 |
| | 218 | 2.8 | 2.8 | -0.649 | | | | |
| | 219 | 0.1 | 2.08 | -0.118 | 2.42 | | | |
| | 219 | 2.8 | 4.5 | -0.649 | | | | |
| | 220 | 0.1 | 2.07 | -0.118 | 4.08 | | | |
| | 220 | 2.8 | 6.15 | -0.649 | | | | |
| Inoc - 21cm | 222 | 0.1 | 2 | -0.118 | 0.93 | 4.425 | 3.99 | 10.68 |
| | 222 | 2.8 | 2.93 | -0.649 | | | | |
| | 223 | 0.1 | 2.05 | -0.118 | 3.23 | | | |
| | 223 | 2.8 | 5.28 | -0.649 | | | | |
| | 224 | 0.1 | 2.07 | -0.118 | 5.62 | | | |
| | 224 | 2.8 | 7.69 | -0.649 | | | | |
| Inoc - 22cm | 226 | 0.1 | 1.98 | -0.118 | 1.06 | 7.640 | 3.69 | 9.89 |
| | 226 | 2.8 | 3.04 | -0.649 | | | | |
| | 227 | 0.1 | 2.04 | -0.118 | 4.3 | | | |
| | 227 | 2.8 | 6.34 | -0.649 | | | | |
| | 234 | 0.1 | 128.37 | -0.118 | 10.98 | | | |
| | 234 | 2.8 | 139.35 | -0.649 | | | | |
| Inoc - 23cm | 235 | 0.1 | 124.27 | -0.118 | 5.64 | 2.945 | 0.43 | 1.14 |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| Inoc - 24cm | 235 | 2.8 | 129.91 | -0.649 | | 0.065 | 0.43 | 1.14 |
| | 236 | 0.1 | 116.68 | -0.118 | 1.87 | | | |
| | 236 | 2.8 | 118.55 | -0.649 | | | | |
| | 237 | 0.1 | 113.65 | -0.118 | 4.02 | | | |
| | 237 | 2.8 | 117.67 | -0.649 | | | | |
| | 238 | 0.1 | 94.66 | -0.118 | 3.46 | | | |
| | 238 | 2.8 | 98.12 | -0.649 | | | | |
| | 239 | 0.1 | 95.99 | -0.118 | 1.56 | | | |
| | 239 | 2.8 | 97.55 | -0.649 | | | | |
| | 240 | 0.1 | 75.17 | -0.118 | -1.43 | | | |
| | 240 | 2.8 | 73.74 | -0.649 | | | | |

Table 2: $O_2$ measurements on gradient tubes inoculated for 6 months.

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| Std - O2 Sat | 70 | 0.5 | 7.73 | -0.201 | 18.01 | 17.61 | 100.00 | |
| | 70 | 2.1 | 25.74 | -0.521 | | | | |
| | 71 | 0.5 | 8.05 | -0.201 | 17.05 | | | |
| | 71 | 2.1 | 25.10 | -0.521 | | | | |
| | 72 | 0.5 | 8.05 | -0.201 | 16.83 | | | |
| | 72 | 2.1 | 24.88 | -0.521 | | | | |
| | 73 | 0.5 | 7.70 | -0.201 | 17.13 | | | |
| | 73 | 2.1 | 24.83 | -0.521 | | | | |
| | 74 | 0.5 | 7.69 | -0.201 | 17.11 | | | |
| | 74 | 2.1 | 24.80 | -0.521 | | | | |
| | 75 | 0.5 | 7.64 | -0.201 | 17.10 | | | |
| | 75 | 2.1 | 24.74 | -0.521 | | | | |
| | 76 | 0.5 | 6.93 | -0.201 | 19.12 | | | |
| | 76 | 2.1 | 26.05 | -0.521 | | | | |
| | 77 | 0.5 | 7.43 | -0.201 | 17.89 | | | |
| | 77 | 2.1 | 25.32 | -0.521 | | | | |
| | 78 | 0.5 | 7.44 | -0.201 | 17.47 | | | |
| | 78 | 2.1 | 24.91 | -0.521 | | | | |
| | 79 | 0.5 | 7.20 | -0.201 | 17.60 | | | |
| | 79 | 2.1 | 24.80 | -0.521 | | | | |
| | 80 | 0.5 | 7.36 | -0.201 | 17.70 | | | |
| | 80 | 2.1 | 25.06 | -0.521 | | | | |
| | 81 | 0.5 | 7.09 | -0.201 | 18.25 | | | |
| | 81 | 2.1 | 25.34 | -0.521 | | | | |
| Std - No O2 | 83 | 0.5 | 0.86 | -0.201 | 0.30 | 0.28 | 0.00 | |
| | 83 | 2.1 | 1.16 | -0.521 | | | | |
| | 84 | 0.5 | 0.72 | -0.201 | 0.30 | | | |
| | 84 | 2.1 | 1.02 | -0.521 | | | | |
| | 85 | 0.5 | 0.74 | -0.201 | 0.28 | | | |
| | 85 | 2.1 | 1.02 | -0.521 | | | | |
| | 86 | 0.5 | 0.72 | -0.201 | 0.24 | | | |
| | 86 | 2.1 | 0.96 | -0.521 | | | | |
| | 87 | 0.5 | 0.62 | -0.201 | 0.30 | | | |
| | 87 | 2.1 | 0.92 | -0.521 | | | | |
| Sterile - 0cm | 90 | 0.5 | 4.67 | -0.201 | 18.25 | 18.25 | 103.73 | 278.00 |
| | 90 | 2.1 | 22.92 | -0.521 | | | | |
| Sterile - 1cm | 91 | 0.5 | 4.57 | -0.201 | 18.27 | 17.91 | 101.74 | 272.66 |
| | 91 | 2.1 | 22.84 | -0.521 | | | | |
| | 93 | 0.5 | 4.74 | -0.201 | 17.54 | | | |
| | 93 | 2.1 | 22.28 | -0.519 | | | | |
| Sterile - 2cm | 94 | 0.5 | 4.64 | -0.201 | 17.54 | 17.33 | 98.42 | 263.76 |
| | 94 | 2.1 | 22.18 | -0.519 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 96 | 0.5 | 4.60 | -0.201 | 17.12 | | | |
| | 96 | 2.1 | 21.72 | -0.519 | | | | |
| Sterile - 3cm | 97 | 0.5 | 4.61 | -0.201 | 16.90 | 16.65 | 94.46 | 253.16 |
| | 97 | 2.1 | 21.51 | -0.519 | | | | |
| | 99 | 0.5 | 4.67 | -0.201 | 16.39 | | | |
| | 99 | 2.1 | 21.06 | -0.519 | | | | |
| Sterile - 4cm | 100 | 0.5 | 4.65 | -0.201 | 16.16 | 15.79 | 89.51 | 239.88 |
| | 100 | 2.1 | 20.81 | -0.519 | | | | |
| | 101 | 0.5 | 4.86 | -0.201 | 15.89 | | | |
| | 101 | 2.1 | 20.75 | -0.519 | | | | |
| | 102 | 0.5 | 4.88 | -0.201 | 15.89 | | | |
| | 102 | 2.1 | 20.77 | -0.519 | | | | |
| | 103 | 0.5 | 4.91 | -0.201 | 15.73 | | | |
| | 103 | 2.1 | 20.64 | -0.519 | | | | |
| | 104 | 0.5 | 4.97 | -0.201 | 15.67 | | | |
| | 104 | 2.1 | 20.64 | -0.519 | | | | |
| | 105 | 0.5 | 4.89 | -0.201 | 15.74 | | | |
| | 105 | 2.1 | 20.63 | -0.519 | | | | |
| | 106 | 0.5 | 5.00 | -0.201 | 15.61 | | | |
| | 106 | 2.1 | 20.61 | -0.519 | | | | |
| | 107 | 0.5 | 4.83 | -0.201 | 15.83 | | | |
| | 107 | 2.1 | 20.66 | -0.519 | | | | |
| | 108 | 0.5 | 4.90 | -0.201 | 15.70 | | | |
| | 108 | 2.1 | 20.60 | -0.519 | | | | |
| | 109 | 0.5 | 4.94 | -0.201 | 15.65 | | | |
| | 109 | 2.1 | 20.59 | -0.519 | | | | |
| Sterile - 5cm | 113 | 0.5 | 4.41 | -0.201 | 15.37 | 15.19 | 86.06 | 230.65 |
| | 113 | 2.1 | 19.78 | -0.519 | | | | |
| | 115 | 0.5 | 4.86 | -0.201 | 15.01 | | | |
| | 115 | 2.1 | 19.87 | -0.519 | | | | |
| Sterile - 6cm | 116 | 0.5 | 4.80 | -0.201 | 14.90 | 14.70 | 83.20 | 222.99 |
| | 116 | 2.1 | 19.70 | -0.519 | | | | |
| | 118 | 0.5 | 4.76 | -0.201 | 14.49 | | | |
| | 118 | 2.1 | 19.25 | -0.519 | | | | |
| Sterile - 7cm | 119 | 0.5 | 4.71 | -0.201 | 14.44 | 14.18 | 80.20 | 214.94 |
| | 119 | 2.1 | 19.15 | -0.519 | | | | |
| | 121 | 0.5 | 4.76 | -0.201 | 13.91 | | | |
| | 121 | 2.1 | 18.67 | -0.519 | | | | |
| Sterile - 8cm | 122 | 0.5 | 4.59 | -0.201 | 13.91 | 13.62 | 77.00 | 206.35 |
| | 122 | 2.1 | 18.50 | -0.519 | | | | |
| | 124 | 0.5 | 4.74 | -0.201 | 13.33 | | | |
| | 124 | 2.1 | 18.07 | -0.519 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| Sterile - 9cm | 125 | 0.5 | 4.74 | -0.201 | 13.17 | 12.99 | 73.33 | 196.53 |
| | 125 | 2.1 | 17.91 | -0.519 | | | | |
| | 127 | 0.5 | 4.68 | -0.201 | 12.80 | | | |
| | 127 | 2.1 | 17.48 | -0.519 | | | | |
| Sterile - 10cm | 128 | 0.5 | 4.64 | -0.201 | 12.69 | 12.48 | 70.42 | 188.71 |
| | 128 | 2.1 | 17.33 | -0.519 | | | | |
| | 130 | 0.5 | 4.55 | -0.201 | 12.27 | | | |
| | 130 | 2.1 | 16.82 | -0.519 | | | | |
| Sterile - 11cm | 131 | 0.5 | 4.50 | -0.201 | 12.10 | 11.85 | 66.75 | 178.89 |
| | 131 | 2.1 | 16.60 | -0.519 | | | | |
| | 133 | 0.5 | 4.46 | -0.201 | 11.59 | | | |
| | 133 | 2.1 | 16.05 | -0.519 | | | | |
| Sterile - 12cm | 134 | 0.5 | 4.39 | -0.201 | 11.41 | 11.08 | 62.30 | 166.97 |
| | 134 | 2.1 | 15.80 | -0.519 | | | | |
| | 136 | 0.5 | 4.58 | -0.201 | 10.74 | | | |
| | 136 | 2.1 | 15.32 | -0.519 | | | | |
| Sterile - 13cm | 137 | 0.5 | 4.30 | -0.201 | 10.67 | 10.46 | 58.75 | 157.46 |
| | 137 | 2.1 | 14.97 | -0.519 | | | | |
| | 139 | 0.5 | 4.34 | -0.201 | 10.25 | | | |
| | 139 | 2.1 | 14.59 | -0.519 | | | | |
| Sterile - 14cm | 140 | 0.5 | 4.44 | -0.201 | 9.89 | 9.64 | 53.99 | 144.69 |
| | 140 | 2.1 | 14.33 | -0.519 | | | | |
| | 142 | 0.5 | 4.40 | -0.201 | 9.38 | | | |
| | 142 | 2.1 | 13.78 | -0.519 | | | | |
| Sterile - 15cm | 143 | 0.5 | 4.25 | -0.201 | 9.30 | 9.10 | 50.87 | 136.34 |
| | 143 | 2.1 | 13.55 | -0.519 | | | | |
| | 145 | 0.5 | 4.29 | -0.201 | 8.89 | | | |
| | 145 | 2.1 | 13.18 | -0.519 | | | | |
| Sterile - 16cm | 146 | 0.5 | 4.21 | -0.201 | 8.56 | 8.39 | 46.77 | 125.35 |
| | 146 | 2.1 | 12.77 | -0.519 | | | | |
| | 148 | 0.5 | 4.26 | -0.201 | 8.21 | | | |
| | 148 | 2.1 | 12.47 | -0.519 | | | | |
| Sterile - 17cm | 149 | 0.5 | 4.07 | -0.201 | 7.99 | 7.77 | 43.19 | 115.76 |
| | 149 | 2.1 | 12.06 | -0.519 | | | | |
| | 151 | 0.5 | 4.23 | -0.201 | 7.54 | | | |
| | 151 | 2.1 | 11.77 | -0.519 | | | | |
| Sterile - 18cm | 152 | 0.5 | 4.12 | -0.201 | 7.32 | 7.15 | 39.61 | 106.16 |
| | 152 | 2.1 | 11.44 | -0.519 | | | | |
| | 154 | 0.5 | 4.00 | -0.201 | 6.97 | | | |
| | 154 | 2.1 | 10.97 | -0.519 | | | | |
| Sterile - 19cm | 155 | 0.5 | 4.00 | -0.201 | 6.53 | 6.31 | 34.79 | 93.24 |
| | 155 | 2.1 | 10.53 | -0.519 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 157 | 0.5 | 4.02 | -0.201 | 6.09 | | | |
| | 157 | 2.1 | 10.11 | -0.519 | | | | |
| Sterile - 20cm | 158 | 0.5 | 3.97 | -0.201 | 5.80 | 5.56 | 30.43 | 81.56 |
| | 158 | 2.1 | 9.77 | -0.519 | | | | |
| | 160 | 0.5 | 4.02 | -0.201 | 5.31 | | | |
| | 160 | 2.1 | 9.33 | -0.519 | | | | |
| Sterile - 21cm | 161 | 0.5 | 3.89 | -0.201 | 5.21 | 5.21 | 28.44 | 76.22 |
| | 161 | 2.1 | 9.10 | -0.519 | | | | |
| Sterile - 22cm | 163 | 0.5 | 3.90 | -0.201 | 4.74 | 4.45 | 24.05 | 64.46 |
| | 163 | 2.1 | 8.64 | -0.519 | | | | |
| | 164 | 0.5 | 3.95 | -0.201 | 4.37 | | | |
| | 164 | 2.1 | 8.32 | -0.519 | | | | |
| | 166 | 0.5 | 3.79 | -0.201 | 4.24 | | | |
| | 166 | 2.1 | 8.03 | -0.519 | | | | |
| Sterile - 23cm | 167 | 0.5 | 3.74 | -0.201 | 3.83 | 3.67 | 19.55 | 52.39 |
| | 167 | 2.1 | 7.57 | -0.519 | | | | |
| | 169 | 0.5 | 3.75 | -0.201 | 3.51 | | | |
| | 169 | 2.1 | 7.26 | -0.519 | | | | |
| Sterile - 24cm | 170 | 0.5 | 3.77 | -0.201 | 3.24 | 3.08 | 16.14 | 43.26 |
| | 170 | 2.1 | 7.01 | -0.519 | | | | |
| | 172 | 0.5 | 3.68 | -0.201 | 2.92 | | | |
| | 172 | 2.1 | 6.60 | -0.519 | | | | |
| Sterile - 25cm | 173 | 0.5 | 3.51 | -0.201 | 2.67 | 2.46 | 12.56 | 33.67 |
| | 173 | 2.1 | 6.18 | -0.519 | | | | |
| | 175 | 0.5 | 3.57 | -0.201 | 2.25 | | | |
| | 175 | 2.1 | 5.82 | -0.519 | | | | |
| Sterile - 26cm | 176 | 0.5 | 3.53 | -0.201 | 1.93 | 1.79 | 8.67 | 23.23 |
| | 176 | 2.1 | 5.46 | -0.519 | | | | |
| | 178 | 0.5 | 3.47 | -0.201 | 1.64 | | | |
| | 178 | 2.1 | 5.11 | -0.519 | | | | |
| Sterile - 27cm | 179 | 0.5 | 3.44 | -0.201 | 1.21 | 1.07 | 4.54 | 12.16 |
| | 179 | 2.1 | 4.65 | -0.519 | | | | |
| | 181 | 0.5 | 3.47 | -0.201 | 0.93 | | | |
| | 181 | 2.1 | 4.40 | -0.519 | | | | |
| Sterile - 28cm | 182 | 0.5 | 3.36 | -0.201 | 0.55 | 0.47 | 1.07 | 2.88 |
| | 182 | 2.1 | 3.91 | -0.519 | | | | |
| | 184 | 0.5 | 3.34 | -0.201 | 0.39 | | | |
| | 184 | 2.1 | 3.73 | -0.519 | | | | |
| Inoc - 0cm | 40 | 2.1 | 26.11 | -0.520 | 20.95 | 17.09 | 98.03 | 262.71 |
| | 40 | 0.5 | 5.16 | -0.201 | | | | |
| | 42 | 2.1 | 24.16 | -0.520 | 16.77 | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 42 | 0.5 | 7.39 | -0.201 | | | | |
| | 43 | 2.1 | 23.73 | -0.520 | 15.35 | | | |
| | 43 | 0.5 | 8.38 | -0.201 | | | | |
| | 44 | 2.1 | 23.60 | -0.520 | 15.27 | | | |
| | 44 | 0.5 | 8.33 | -0.201 | | | | |
| Inoc - 1cm | 46 | 2.1 | 23.76 | -0.520 | 18.27 | 15.98 | 91.54 | 245.33 |
| | 46 | 0.5 | 5.49 | -0.201 | | | | |
| | 49 | 2.1 | 23.06 | -0.520 | 14.80 | | | |
| | 49 | 0.5 | 8.26 | -0.201 | | | | |
| | 50 | 2.1 | 23.05 | -0.520 | 14.88 | | | |
| | 50 | 0.5 | 8.17 | -0.201 | | | | |
| Inoc - 2cm | 51 | 2.1 | 23.07 | -0.520 | 17.44 | 15.43 | 88.30 | 236.65 |
| | 51 | 0.5 | 5.63 | -0.201 | | | | |
| | 54 | 2.1 | 22.32 | -0.520 | 14.40 | | | |
| | 54 | 0.5 | 7.92 | -0.201 | | | | |
| | 55 | 2.1 | 22.29 | -0.520 | 14.46 | | | |
| | 55 | 0.5 | 7.83 | -0.201 | | | | |
| Inoc - 3cm | 56 | 2.1 | 22.36 | -0.520 | 15.79 | 14.67 | 83.83 | 224.66 |
| | 56 | 0.5 | 6.57 | -0.201 | | | | |
| | 59 | 2.1 | 21.59 | -0.520 | 14.11 | | | |
| | 59 | 0.5 | 7.48 | -0.201 | | | | |
| | 60 | 2.1 | 21.56 | -0.520 | 14.12 | | | |
| | 60 | 0.5 | 7.44 | -0.201 | | | | |
| Inoc - 4cm | 61 | 2.1 | 21.73 | -0.520 | 15.33 | 14.36 | 82.00 | 219.77 |
| | 61 | 0.5 | 6.40 | -0.201 | | | | |
| | 64 | 2.1 | 20.96 | -0.520 | 13.84 | | | |
| | 64 | 0.5 | 7.12 | -0.201 | | | | |
| | 65 | 2.1 | 20.93 | -0.520 | 13.92 | | | |
| | 65 | 0.5 | 7.01 | -0.201 | | | | |
| Inoc - 5cm | 66 | 2.1 | 20.81 | -0.520 | 14.63 | 13.78 | 78.59 | 210.61 |
| | 66 | 0.5 | 6.18 | -0.201 | | | | |
| | 69 | 2.1 | 20.06 | -0.520 | 13.35 | | | |
| | 69 | 0.5 | 6.71 | -0.201 | | | | |
| | 70 | 2.1 | 20.05 | -0.520 | 13.37 | | | |
| | 70 | 0.5 | 6.68 | -0.201 | | | | |
| Inoc - 6cm | 71 | 2.1 | 19.87 | -0.520 | 14.13 | 13.17 | 74.98 | 200.93 |
| | 71 | 0.5 | 5.74 | -0.201 | | | | |
| | 74 | 2.1 | 19.00 | -0.520 | 12.66 | | | |
| | 74 | 0.5 | 6.34 | -0.201 | | | | |
| | 75 | 2.1 | 18.97 | -0.520 | 12.72 | | | |
| | 75 | 0.5 | 6.25 | -0.201 | | | | |
| Inoc - 7cm | 76 | 2.1 | 18.77 | -0.520 | 13.15 | 12.48 | 70.93 | 190.10 |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 76 | 0.5 | 5.62 | -0.201 | | | | |
| | 79 | 2.1 | 18.00 | -0.520 | 12.09 | | | |
| | 79 | 0.5 | 5.91 | -0.201 | | | | |
| | 80 | 2.1 | 17.99 | -0.520 | 12.21 | | | |
| | 80 | 0.5 | 5.78 | -0.201 | | | | |
| Inoc - 8cm | 81 | 2.1 | 18.18 | -0.520 | 13.51 | 12.33 | 70.03 | 187.68 |
| | 81 | 0.5 | 4.67 | -0.201 | | | | |
| | 84 | 2.1 | 17.33 | -0.520 | 11.72 | | | |
| | 84 | 0.5 | 5.61 | -0.201 | | | | |
| | 85 | 2.1 | 17.28 | -0.520 | 11.76 | | | |
| | 85 | 0.5 | 5.52 | -0.201 | | | | |
| Inoc - 9cm | 86 | 2.1 | 17.38 | -0.520 | 12.59 | 11.75 | 66.61 | 178.53 |
| | 86 | 0.5 | 4.79 | -0.201 | | | | |
| | 89 | 2.1 | 16.59 | -0.520 | 11.31 | | | |
| | 89 | 0.5 | 5.28 | -0.201 | | | | |
| | 90 | 2.1 | 16.54 | -0.520 | 11.35 | | | |
| | 90 | 0.5 | 5.19 | -0.201 | | | | |
| Inoc - 10cm | 91 | 2.1 | 16.76 | -0.520 | 12.58 | 11.48 | 65.02 | 174.27 |
| | 91 | 0.5 | 4.18 | -0.201 | | | | |
| | 94 | 2.1 | 15.95 | -0.520 | 10.93 | | | |
| | 94 | 0.5 | 5.02 | -0.201 | | | | |
| | 95 | 2.1 | 15.90 | -0.520 | 10.93 | | | |
| | 95 | 0.5 | 4.97 | -0.201 | | | | |
| Inoc - 11cm | 96 | 2.1 | 15.96 | -0.520 | 11.41 | 10.87 | 61.43 | 164.64 |
| | 96 | 0.5 | 4.55 | -0.201 | | | | |
| | 99 | 2.1 | 15.34 | -0.520 | 10.58 | | | |
| | 99 | 0.5 | 4.76 | -0.201 | | | | |
| | 100 | 2.1 | 15.33 | -0.520 | 10.62 | | | |
| | 100 | 0.5 | 4.71 | -0.201 | | | | |
| Inoc - 12cm | 101 | 2.1 | 15.58 | -0.520 | 11.81 | 10.82 | 61.16 | 163.90 |
| | 101 | 0.5 | 3.77 | -0.201 | | | | |
| | 104 | 2.1 | 14.86 | -0.520 | 10.32 | | | |
| | 104 | 0.5 | 4.54 | -0.201 | | | | |
| | 105 | 2.1 | 14.82 | -0.520 | 10.34 | | | |
| | 105 | 0.5 | 4.48 | -0.201 | | | | |
| Inoc - 13cm | 106 | 2.1 | 14.76 | -0.520 | 10.84 | 10.22 | 57.61 | 154.38 |
| | 106 | 0.5 | 3.92 | -0.201 | | | | |
| | 109 | 2.1 | 14.16 | -0.520 | 9.91 | | | |
| | 109 | 0.5 | 4.25 | -0.201 | | | | |
| | 110 | 2.1 | 14.12 | -0.520 | 9.91 | | | |
| | 110 | 0.5 | 4.21 | -0.201 | | | | |
| Inoc - 14cm | 111 | 2.1 | 13.91 | -0.520 | 10.30 | 9.60 | 53.94 | 144.55 |
| | 111 | 0.5 | 3.61 | -0.201 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 114 | 2.1 | 13.21 | -0.520 | 9.23 | | | |
| | 114 | 0.5 | 3.98 | -0.201 | | | | |
| | 115 | 2.1 | 13.14 | -0.520 | 9.26 | | | |
| | 115 | 0.5 | 3.88 | -0.201 | | | | |
| Inoc - 15cm | 116 | 2.1 | 12.97 | -0.520 | 9.46 | 8.93 | 49.99 | 133.97 |
| | 116 | 0.5 | 3.51 | -0.201 | | | | |
| | 119 | 2.1 | 12.33 | -0.520 | 8.66 | | | |
| | 119 | 0.5 | 3.67 | -0.201 | | | | |
| | 120 | 2.1 | 12.26 | -0.520 | 8.66 | | | |
| | 120 | 0.5 | 3.60 | -0.201 | | | | |
| Inoc - 16cm | 121 | 2.1 | 12.15 | -0.520 | 8.85 | 8.36 | 46.67 | 125.08 |
| | 121 | 0.5 | 3.30 | -0.201 | | | | |
| | 124 | 2.1 | 11.55 | -0.520 | 8.12 | | | |
| | 124 | 0.5 | 3.43 | -0.201 | | | | |
| | 125 | 2.1 | 11.50 | -0.520 | 8.12 | | | |
| | 125 | 0.5 | 3.38 | -0.201 | | | | |
| Inoc - 17cm | 126 | 2.1 | 11.49 | -0.520 | 8.61 | 7.93 | 44.10 | 118.19 |
| | 126 | 0.5 | 2.88 | -0.201 | | | | |
| | 129 | 2.1 | 10.81 | -0.520 | 7.60 | | | |
| | 129 | 0.5 | 3.21 | -0.201 | | | | |
| | 130 | 2.1 | 10.74 | -0.520 | 7.57 | | | |
| | 130 | 0.5 | 3.17 | -0.201 | | | | |
| Inoc - 18cm | 131 | 2.1 | 10.67 | -0.520 | 7.98 | 7.34 | 40.65 | 108.94 |
| | 131 | 0.5 | 2.69 | -0.201 | | | | |
| | 134 | 2.1 | 10.01 | -0.520 | 7.01 | | | |
| | 134 | 0.5 | 3.00 | -0.201 | | | | |
| | 135 | 2.1 | 9.97 | -0.520 | 7.03 | | | |
| | 135 | 0.5 | 2.94 | -0.201 | | | | |
| Inoc - 18.5cm | 136 | 2.1 | 10.20 | -0.520 | 7.89 | 7.08 | 39.14 | 104.89 |
| | 136 | 0.5 | 2.31 | -0.201 | | | | |
| | 139 | 2.1 | 9.58 | -0.520 | 6.66 | | | |
| | 139 | 0.5 | 2.92 | -0.201 | | | | |
| | 140 | 2.1 | 9.54 | -0.520 | 6.70 | | | |
| | 140 | 0.5 | 2.84 | -0.201 | | | | |
| Inoc - 19cm | 141 | 2.1 | 9.75 | -0.520 | 7.61 | 6.78 | 37.35 | 100.10 |
| | 141 | 0.5 | 2.14 | -0.201 | | | | |
| | 144 | 2.1 | 9.19 | -0.520 | 6.35 | | | |
| | 144 | 0.5 | 2.84 | -0.201 | | | | |
| | 145 | 2.1 | 9.13 | -0.520 | 6.38 | | | |
| | 145 | 0.5 | 2.75 | -0.201 | | | | |
| | 146 | | | | -107.05 | | | |
| | 146 | 8.1 | 107.05 | -1.684 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| Inoc - 19.5cm | 147 | 2.1 | 8.71 | -0.520 | 6.17 | 6.16 | 34.03 | 91.21 |
| | 147 | 0.5 | 2.54 | -0.201 | | | | |
| | 150 | | | | -102.39 | | | |
| | 150 | 8.1 | 102.39 | -1.684 | | | | |
| | 151 | 2.1 | 8.52 | -0.520 | 6.24 | | | |
| | 151 | 0.5 | 2.28 | -0.201 | | | | |
| | 152 | 2.1 | 8.56 | -0.520 | 6.24 | | | |
| | 152 | 0.5 | 2.32 | -0.201 | | | | |
| Inoc - 20cm | 153 | 2.1 | 8.19 | -0.520 | 5.97 | 5.96 | 32.54 | 87.21 |
| | 153 | 0.5 | 2.22 | -0.201 | | | | |
| | 156 | | | | -97.17 | | | |
| | 156 | 8.1 | 97.17 | -1.684 | | | | |
| | 157 | 2.1 | 8.07 | -0.520 | 5.96 | | | |
| | 157 | 0.5 | 2.11 | -0.201 | | | | |
| | 158 | 2.1 | 8.12 | -0.520 | 5.96 | | | |
| | 158 | 0.5 | 2.16 | -0.201 | | | | |
| Inoc - 20.5cm | 159 | 2.1 | 7.84 | -0.520 | 5.70 | 31.07 | 31.07 | 83.27 |
| | 159 | 0.5 | 2.14 | -0.201 | | | | |
| | 162 | | | | -94.67 | | | |
| | 162 | 8.1 | 94.67 | -1.684 | | | | |
| | 163 | 2.1 | 7.73 | -0.520 | 5.70 | | | |
| | 163 | 0.5 | 2.03 | -0.201 | | | | |
| | 164 | 2.1 | 7.81 | -0.520 | 5.74 | | | |
| | 164 | 0.5 | 2.07 | -0.201 | | | | |
| Inoc - 21cm | 165 | 2.1 | 7.53 | -0.520 | 5.48 | 5.47 | 29.66 | 79.48 |
| | 165 | 0.5 | 2.05 | -0.201 | | | | |
| | 168 | | | | -91.81 | | | |
| | 168 | 8.1 | 91.81 | -1.684 | | | | |
| | 169 | 2.1 | 7.39 | -0.520 | 5.46 | | | |
| | 169 | 0.5 | 1.93 | -0.201 | | | | |
| | 170 | 2.1 | 7.44 | -0.520 | 5.48 | | | |
| | 170 | 0.5 | 1.96 | -0.201 | | | | |
| Inoc - 21.5cm | 171 | 2.1 | 7.01 | -0.520 | 5.11 | 5.06 | 27.24 | 73.01 |
| | 171 | 0.5 | 1.90 | -0.201 | | | | |
| | 174 | | | | -89.73 | | | |
| | 174 | 8.1 | 89.73 | -1.684 | | | | |
| | 175 | 2.1 | 6.87 | -0.520 | 5.05 | | | |
| | 175 | 0.5 | 1.82 | -0.201 | | | | |
| | 176 | 2.1 | 6.89 | -0.520 | 5.03 | | | |
| | 176 | 0.5 | 1.86 | -0.201 | | | | |
| Inoc - 22cm | 177 | 2.1 | 6.56 | -0.520 | 4.82 | 4.70 | 25.10 | 67.28 |
| | 177 | 0.5 | 1.74 | -0.201 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 180 | | | | -87.49 | | | |
| | 180 | 8.1 | 87.49 | -1.684 | | | | |
| | 181 | 2.1 | 6.34 | -0.520 | 4.62 | | | |
| | 181 | 0.5 | 1.72 | -0.201 | | | | |
| | 182 | 2.1 | 6.39 | -0.520 | 4.66 | | | |
| | 182 | 0.5 | 1.73 | -0.201 | | | | |
| Inoc - 22.5cm | 183 | 2.1 | 5.96 | -0.520 | 4.34 | 4.30 | 22.75 | 60.96 |
| | 183 | 0.5 | 1.62 | -0.201 | | | | |
| | 186 | | | | -85.18 | | | |
| | 186 | 8.1 | 85.18 | -1.684 | | | | |
| | 187 | 2.1 | 5.88 | -0.520 | 4.27 | | | |
| | 187 | 0.5 | 1.61 | -0.201 | | | | |
| | 188 | 2.1 | 5.95 | -0.520 | 4.29 | | | |
| | 188 | 0.5 | 1.66 | -0.201 | | | | |
| Inoc - 23cm | 189 | 2.1 | 5.59 | -0.520 | 3.99 | 4.02 | 21.10 | 56.55 |
| | 189 | 0.5 | 1.60 | -0.201 | | | | |
| | 192 | | | | -83.79 | | | |
| | 192 | 8.1 | 83.79 | -1.684 | | | | |
| | 193 | 2.1 | 5.58 | -0.520 | 4.03 | | | |
| | 193 | 0.5 | 1.55 | -0.201 | | | | |
| | 194 | 2.1 | 5.64 | -0.520 | 4.04 | | | |
| | 194 | 0.5 | 1.60 | -0.201 | | | | |
| Inoc - 23.5cm | 195 | 2.1 | 5.38 | -0.520 | 3.85 | 3.83 | 19.96 | 53.49 |
| | 195 | 0.5 | 1.53 | -0.201 | | | | |
| | 198 | | | | -82.13 | | | |
| | 198 | 8.1 | 82.13 | -1.684 | | | | |
| | 199 | 2.1 | 5.33 | -0.520 | 3.82 | | | |
| | 199 | 0.5 | 1.51 | -0.201 | | | | |
| | 200 | 2.1 | 5.37 | -0.520 | 3.81 | | | |
| | 200 | 0.5 | 1.56 | -0.201 | | | | |
| Inoc - 24cm | 201 | 2.1 | 5.05 | -0.520 | 3.58 | 3.60 | 18.63 | 49.92 |
| | 201 | 0.5 | 1.47 | -0.201 | | | | |
| | 204 | | | | -80.41 | | | |
| | 204 | 8.1 | 80.41 | -1.684 | | | | |
| | 205 | 2.1 | 5.11 | -0.520 | 3.61 | | | |
| | 205 | 0.5 | 1.50 | -0.201 | | | | |
| | 206 | 2.1 | 5.15 | -0.520 | 3.61 | | | |
| | 206 | 0.5 | 1.54 | -0.201 | | | | |
| Inoc - 24.5cm | 207 | 2.1 | 4.84 | -0.520 | 3.40 | 3.37 | 17.29 | 46.34 |
| | 207 | 0.5 | 1.44 | -0.201 | | | | |
| | 210 | | | | -78.99 | | | |
| | 210 | 8.1 | 78.99 | -1.684 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 211 | 2.1 | 4.82 | -0.520 | 3.36 | | | |
| | 211 | 0.5 | 1.46 | -0.201 | | | | |
| | 212 | 2.1 | 4.85 | -0.520 | 3.36 | | | |
| | 212 | 0.5 | 1.49 | -0.201 | | | | |
| Inoc - 25cm | 213 | 2.1 | 4.56 | -0.520 | 3.15 | 3.12 | 15.78 | 42.29 |
| | 213 | 0.5 | 1.41 | -0.201 | | | | |
| | 216 | | | | -77.82 | | | |
| | 216 | 8.1 | 77.82 | -1.684 | | | | |
| | 217 | 2.1 | 4.52 | -0.520 | 3.10 | | | |
| | 217 | 0.5 | 1.42 | -0.201 | | | | |
| | 218 | 2.1 | 4.55 | -0.520 | 3.10 | | | |
| | 218 | 0.5 | 1.45 | -0.201 | | | | |
| Inoc - 26cm | 219 | 2.1 | 4.08 | -0.520 | 2.74 | 2.66 | 13.09 | 35.08 |
| | 219 | 0.5 | 1.34 | -0.201 | | | | |
| | 222 | | | | -76.84 | | | |
| | 222 | 8.1 | 76.84 | -1.684 | | | | |
| | 223 | 2.1 | 3.99 | -0.520 | 2.62 | | | |
| | 223 | 0.5 | 1.37 | -0.201 | | | | |
| | 224 | 2.1 | 4.01 | -0.520 | 2.62 | | | |
| | 224 | 0.5 | 1.39 | -0.201 | | | | |
| Inoc - 27cm | 225 | 2.1 | 3.52 | -0.520 | 2.24 | 2.16 | 10.15 | 27.19 |
| | 225 | 0.5 | 1.28 | -0.201 | | | | |
| | 228 | | | | -75.47 | | | |
| | 228 | 8.1 | 75.47 | -1.684 | | | | |
| | 229 | 2.1 | 3.38 | -0.520 | 2.11 | | | |
| | 229 | 0.5 | 1.27 | -0.201 | | | | |
| | 230 | 2.1 | 3.42 | -0.520 | 2.13 | | | |
| | 230 | 0.5 | 1.29 | -0.201 | | | | |
| Inoc - 28cm | 231 | 2.1 | 2.90 | -0.520 | 1.74 | 1.67 | 7.26 | 19.46 |
| | 231 | 0.5 | 1.16 | -0.201 | | | | |
| | 234 | | | | -73.97 | | | |
| | 234 | 8.1 | 73.97 | -1.684 | | | | |
| | 235 | 2.1 | 2.82 | -0.520 | 1.64 | | | |
| | 235 | 0.5 | 1.18 | -0.201 | | | | |
| | 236 | 2.1 | 2.86 | -0.520 | 1.63 | | | |
| | 236 | 0.5 | 1.23 | -0.201 | | | | |
| Inoc - 29cm | 237 | 2.1 | 2.34 | -0.520 | 1.25 | 1.19 | 4.44 | 11.89 |
| | 237 | 0.5 | 1.09 | -0.201 | | | | |
| | 240 | | | | -72.91 | | | |
| | 240 | 8.1 | 72.91 | -1.684 | | | | |
| | 241 | 2.1 | 2.29 | -0.520 | 1.16 | | | |
| | 241 | 0.5 | 1.13 | -0.201 | | | | |

| Sample | Page | Time (s) | I (nA) | E (V) | Difference | Average | Sat O2 (%) | O2 (umol) |
|---|---|---|---|---|---|---|---|---|
| | 242 | 2.1 | 2.32 | -0.520 | 1.16 | | | |
| | 242 | 0.5 | 1.16 | -0.201 | | | | |
| Inoc - 29.5cm | 243 | 2.1 | 2.06 | -0.520 | 1.01 | 0.94 | 2.96 | 7.94 |
| | 243 | 0.5 | 1.05 | -0.201 | | | | |
| | 246 | | | | -72.43 | | | |
| | 246 | 8.1 | 72.43 | -1.684 | | | | |
| | 247 | 2.1 | 2.00 | -0.520 | 0.90 | | | |
| | 247 | 0.5 | 1.10 | -0.201 | | | | |
| | 248 | 2.1 | 2.04 | -0.520 | 0.91 | | | |
| | 248 | 0.5 | 1.13 | -0.201 | | | | |
| Inoc - 30cm | 249 | 2.1 | 1.81 | -0.520 | 0.81 | 0.76 | 1.88 | 5.05 |
| | 249 | 0.5 | 1.00 | -0.201 | | | | |
| | 252 | | | | -71.75 | | | |
| | 252 | 8.1 | 71.75 | -1.684 | | | | |
| | 253 | 2.1 | 1.79 | -0.520 | 0.74 | | | |
| | 253 | 0.5 | 1.05 | -0.201 | | | | |
| | 254 | 2.1 | 1.80 | -0.520 | 0.72 | | | |
| | 254 | 0.5 | 1.08 | -0.201 | | | | |

MARINOBACTER CHARACTERIZATION

The Marinobacter isolate was successfully cultured in a variety of media types: Methanogen, Sulfate reducer, Luria broth, Iron reducer and oxidizer. Most of these media types contain organic carbon, with the exception of the iron oxidizer growth medias. This suggests that the Marinobacter isolate is capable of heterotrophic growth and is a facultative anaerobe. The isolate was also found to be capable of iron oxidation under circumneutral pH, utilizing both $O_2$ and $NO_2$ as an electron acceptor. Other than growth media testing, the isolate was also characterized using imaging and molecular techniques.

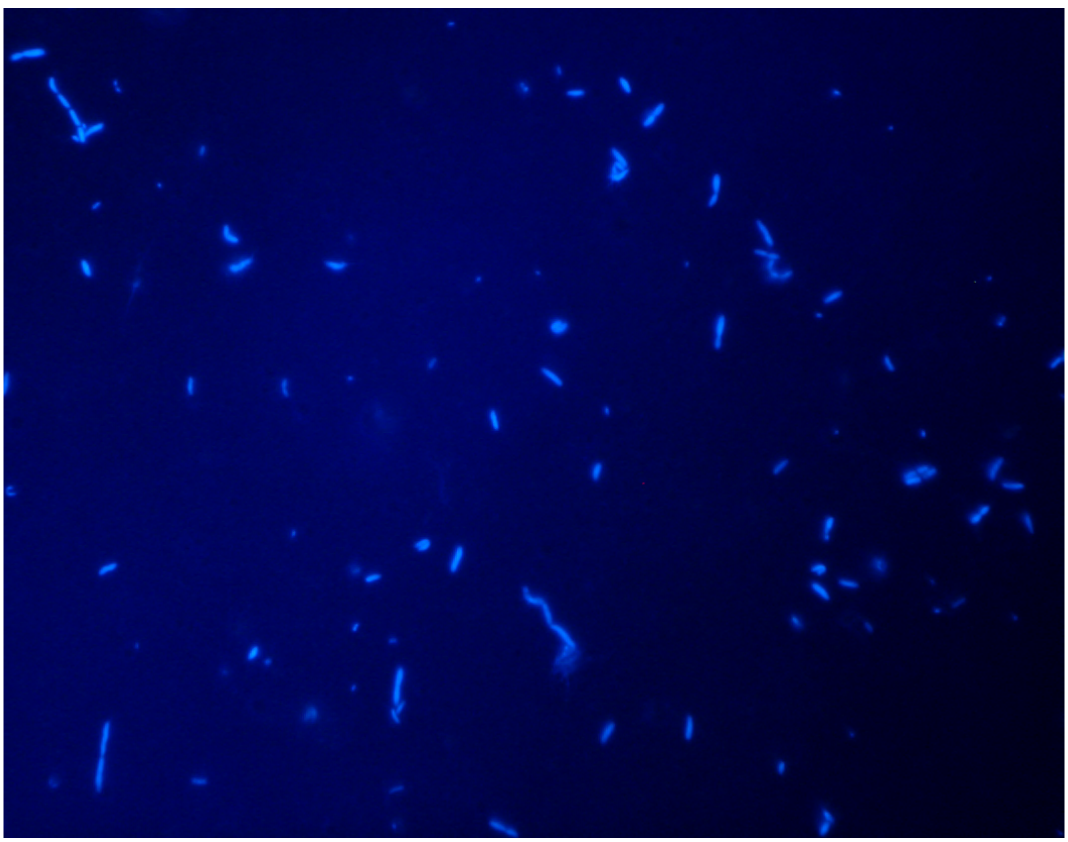

Figure 2: DAPI microscopic image of *Marinobacter* isolate.

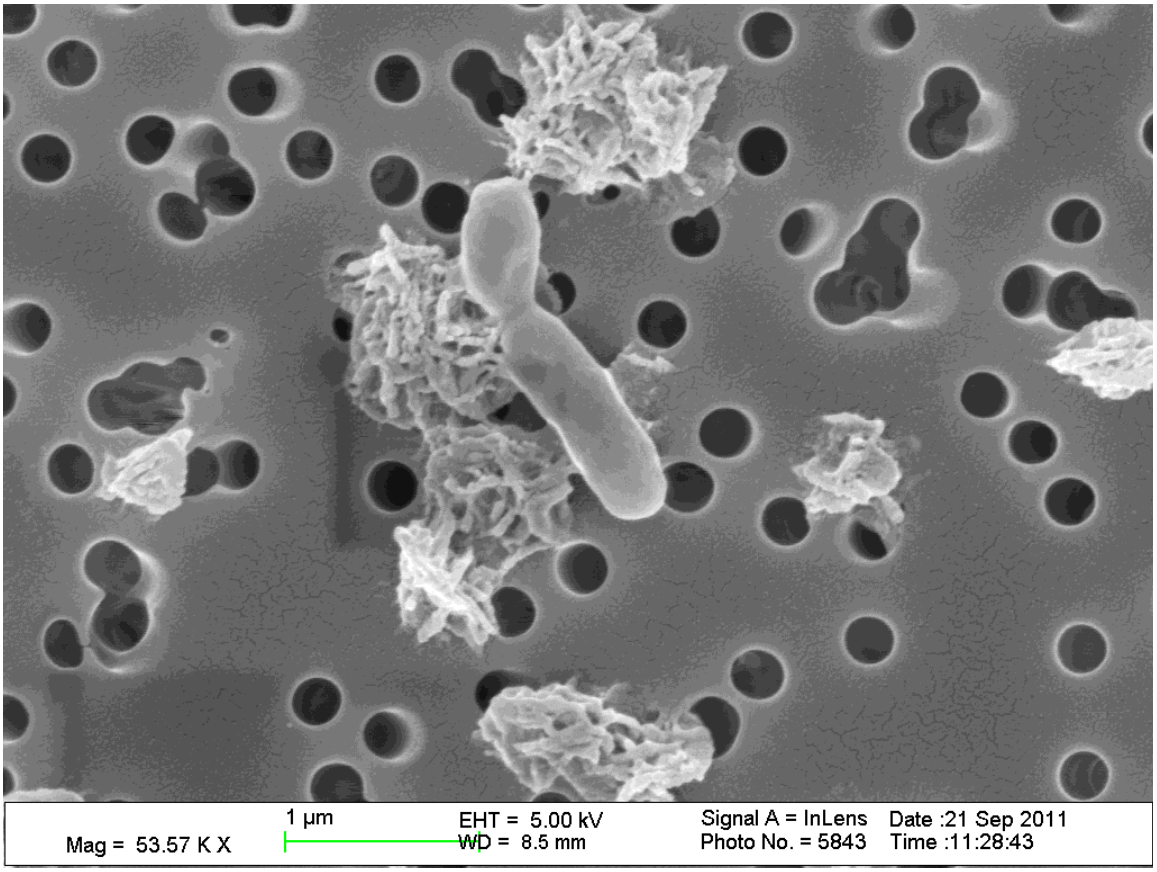


Figure 3: SEM image of *Marinobacter* isolate.

The isolate was imaged in culture using DAPI staining and microscopic imaging (Figure 2) and also chemical critical point drying and SEM imaging (Figure 3). Cells are rod shaped, and are approximately 1-2μm in size. Molecular techniques identified the isolate as a species of the *Marinobacter* genus, of the γ–Proteobacteria phylum, and the Phylogenetic tree of the nearest neighbors was completed (Figure 4). Using the sequencing results, the FISH primer [Cy3]ACAGGTGCTGCATGGCCGTC was constructed and synthesized by Eurofins

MWG Operon (Huntsville, Alabama) for imaging the *Marinobacter* isolate. FISH protocols (Glockner et al., 1996) were followed, however, the isolate was never successfully imaged with the FISH primer.

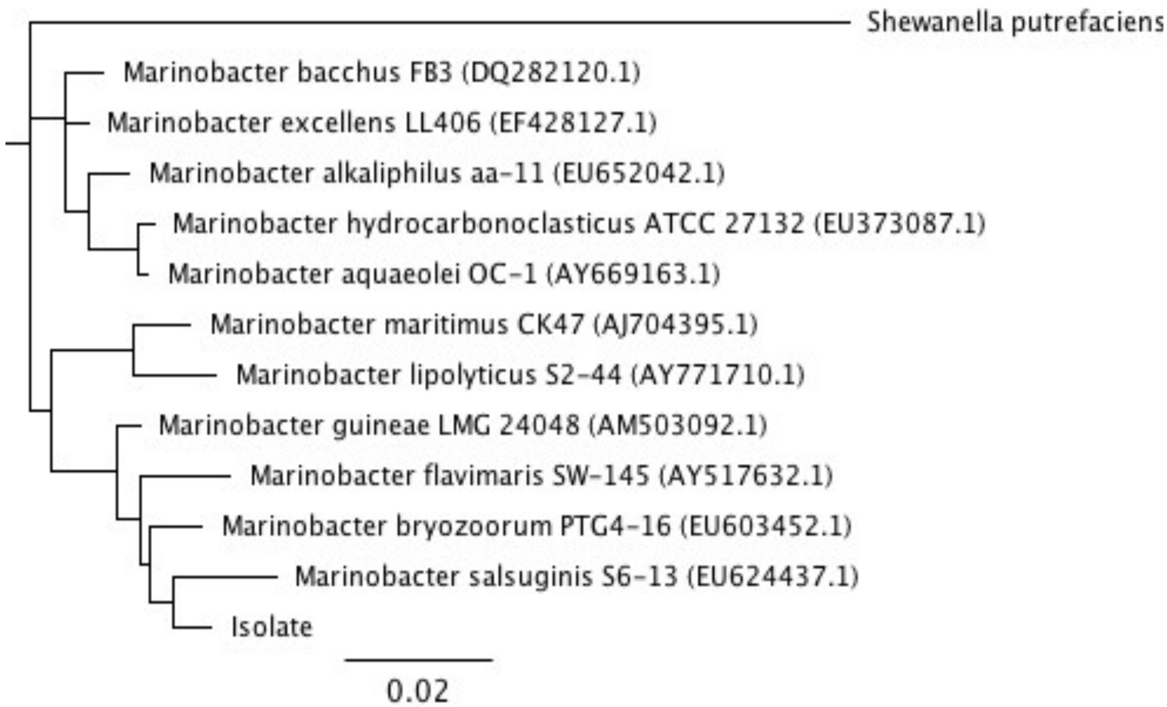


Figure 4: Phylogenetic tree of *Marinobacter* isolate.

## REFERENCES

Druschel, G.K., Emerson, D., Sutka, R., Suchecki, P., and Luther, G.W., 2008, Low-oxygen and chemical kinetic constraints on the geochemical niche of neutrophilic iron(II) oxidizing microorganisms: Geochimica Et Cosmochimica Acta, v. 72, p. 3358-3370.

Emerson, D., and Floyd, M.M., 2005, Enrichment and isolation of iron-oxidizing bacteria at neutral pH, Environmental Microbiology, Volume 397: Methods in Enzymology, p. 112-123.

Emerson, D., and Moyer, C., 1997, Isolation and characterization of novel iron-oxidizing bacteria that grow at circumneutral pH: Applied and Environmental Microbiology, v. 63, p. 4784-4792.

Glockner, F.O., Aman, R., Alfreider, A., Pernthaler, J., Psenner, R., Trebesius, K., and Schleifer, K.H., 1996, An in situ hybridization protocol for detection and identification of planktonic bacteria: Systematic and Applied Microbiology, v. 19, p. 403-406.

Sobolev, D., and Roden, E.E., 2001, Suboxic deposition of ferric iron by bacteria in opposing gradients of Fe(II) and oxygen at circumneutral pH: Applied and Environmental Microbiology, v. 67, p. 1328-1334.

# APPENDIX E. GEOCHEMISTRY OF LARGE COLUMN EXPERIMENTS

| ACME ID | Experimental ID | Sample Date | Nitrate (N) | Dissolved Sulphate (SO4) | Dissolved Chloride (Cl) | Orthophos phate (P) | Nitrite (N) |
|---|---|---|---|---|---|---|---|
| ANCOL-011 | Arr/LB A | Dec 20/2010 | 0.45 | 679.0 | 26 | <0.005 | <0.05 |
| ANCOL-071 | Arr/LB A | Dec 30/2010 | 0.30 | 324.0 | 27 | 0.075 | <0.05 |
| ANCOL-017 | Arr/LB A | Jan 14/2011 | 0.23 | 33.8 | 19 | <0.005 | <0.05 |
| ANCOL-077 | Arr/LB A | Jan 24/2011 | <0.20 | 30.6 | 24 | 0.006 | <0.05 |
| ANCOL-023 | Arr/LB A | Feb 9/2011 | <0.20 | 31.1 | 41 | <0.005 | <0.05 |
| ANCOL-029 | Arr/LB A | March 7/2011 | <0.20 | 24.3 | 29 | <0.005 | <0.05 |
| ANCOL-035 | Arr/LB A | March 28/2011 | <0.20 | 22.8 | 26 | 0.022 | <0.05 |
| ANCOL-041 | Arr/LB A | April 13/2011 | <0.20 | 21.5 | 32 | 0.028 | <0.05 |
| ANCOL-047 | Arr/LB A | May 11/2011 | <0.20 | 91.5 | 21 | <0.005 | <0.05 |
| ANCOL-053 | Arr/LB A | June 8/2011 | <0.20 | 14.7 | 20 | <0.005 | <0.05 |
| ANCOL-059 | Arr/LB A | July 8/2011 | <0.20 | 16.7 | 24 | 0.074 | <0.05 |
| ANCOL-065 | Arr/LB A | Dec 9/2011 | <0.20 | 22.6 | 30 | <0.005 | <0.05 |
| ANCOL-009 | Raglan A | Dec 20/2010 | <0.20 | 87.2 | 40 | 0.052 | <0.05 |
| ANCOL-069 | Raglan A | Dec 30/2010 | <0.20 | 80.1 | 31 | 0.221 | <0.05 |
| ANCOL-015 | Raglan A | Jan 14/2011 | <0.20 | 81.9 | 30 | 0.026 | <0.05 |
| ANCOL-075 | Raglan A | Jan 24/2011 | <0.20 | <5.0 | 26 | 0.091 | <0.05 |
| ANCOL-021 | Raglan A | Feb 9/2011 | <0.20 | 13.0 | 43 | 0.186 | <0.05 |
| ANCOL-027 | Raglan A | March 7/2011 | 0.43 | <5.0 | 33 | 0.379 | <0.05 |
| ANCOL-033 | Raglan A | March 28/2011 | <0.20 | <5.0 | 30 | 0.693 | <0.05 |
| ANCOL-039 | Raglan A | April 13/2011 | <0.20 | <5.0 | 41 | 0.526 | <0.05 |
| ANCOL-045 | Raglan A | May 11/2011 | <0.20 | <5.0 | 34 | 0.531 | <0.05 |
| ANCOL-051 | Raglan A | June 8/2011 | <0.20 | <5.0 | 25 | 0.427 | <0.05 |
| ANCOL-057 | Raglan A | July 8/2011 | <0.20 | 0.7 | 24 | 0.108 | <0.05 |
| ANCOL-063 | Raglan A | Dec 9/2011 | <0.20 | 0.6 | 37 | 0.066 | <0.05 |
| ANCOL-005 | Tal/T7 A | Nov 29/2010 | <0.20 | 14.1 | 30 | <0.005 | <0.05 |
| ANCOL-007 | Tal/T7 A | Dec 20/2010 | <0.20 | 24.8 | 27 | <0.005 | <0.05 |
| ANCOL-067 | Tal/T7 A | Dec 30/2010 | <0.20 | 17.8 | 29 | <0.005 | <0.05 |
| ANCOL-013 | Tal/T7 A | Jan 14/2011 | <0.20 | 23.3 | 44 | <0.005 | <0.05 |
| ANCOL-073 | Tal/T7 A | Jan 24/2011 | <0.20 | 11.3 | 39 | 0.022 | <0.05 |
| ANCOL-019 | Tal/T7 A | Feb 9/2011 | <0.20 | 31.1 | 36 | <0.005 | <0.05 |
| ANCOL-025 | Tal/T7 A | March 7/2011 | <0.20 | 15.1 | 19 | <0.005 | <0.05 |
| ANCOL-031 | Tal/T7 A | March 28/2011 | <0.20 | 15.4 | 28 | <0.005 | <0.05 |
| ANCOL-037 | Tal/T7 A | April 13/2011 | <0.20 | 29.0 | 31 | <0.005 | <0.05 |
| ANCOL-043 | Tal/T7 A | May 11/2011 | 0.26 | 11.0 | 29 | <0.005 | <0.05 |
| ANCOL-049 | Tal/T7 A | June 8/2011 | <0.20 | 14.1 | 43 | 0.011 | <0.05 |
| ANCOL-055 | Tal/T7 A | July 8/2011 | <0.20 | 20.6 | 28 | <0.005 | <0.05 |
| ANCOL-061 | Tal/T7 A | Dec 9/2011 | <0.20 | 15.7 | 32 | 0.023 | <0.05 |
| ANCOL-001 | Tal/T7 A | Oct 11/2010 | <0.20 | 96.3 | 35 | <0.005 | <0.05 |
| ANCOL-003 | Tal/T7 A | Nov 4/2010 | 0.22 | 29.2 | 33 | <0.005 | <0.05 |
| ANCOL-012 | Arr/LB B | Dec 20/2010 | 0.36 | 608.0 | 27 | 0.007 | <0.05 |
| ANCOL-072 | Arr/LB B | Dec 30/2010 | <0.20 | 401.0 | 27 | 0.012 | <0.05 |
| ANCOL-078 | Arr/LB B | Jan 24/2011 | <0.20 | 32.3 | 26 | 0.006 | <0.05 |
| ANCOL-024 | Arr/LB B | Feb 9/2011 | <0.20 | 29.2 | 42 | <0.005 | <0.05 |
| ANCOL-030 | Arr/LB B | March 7/2011 | <0.20 | 24.3 | 29 | <0.005 | <0.05 |
| ANCOL-036 | Arr/LB B | March 28/2011 | 0.24 | 6.4 | 6.7 | <0.005 | <0.05 |
| ANCOL-042 | Arr/LB B | April 13/2011 | <0.20 | 21.9 | 32 | <0.005 | <0.05 |
| ANCOL-048 | Arr/LB B | May 11/2011 | <0.20 | 15.3 | 22 | <0.005 | <0.05 |
| ANCOL-054 | Arr/LB B | June 8/2011 | <0.20 | 14.4 | 21 | 0.024 | <0.05 |

| ACME ID | Experimental ID | Sample Date | Nitrate (N) | Dissolved Sulphate (SO4) | Dissolved Chloride (Cl) | Orthophosphate (P) | Nitrite (N) |
|---|---|---|---|---|---|---|---|
| ANCOL-060 | Arr/LB B | July 8/2011 | <0.20 | 16.7 | 24 | 0.036 | <0.05 |
| ANCOL-066 | Arr/LB B | Dec 9/2011 | <0.20 | 23.0 | 29 | <0.005 | <0.05 |
| ANCOL-010 | Raglan B | Dec 20/2010 | <0.20 | 55.5 | 41 | 0.088 | <0.05 |
| ANCOL-070 | Raglan B | Dec 30/2010 | <0.20 | 215.0 | 35 | 0.093 | <0.05 |
| ANCOL-016 | Raglan B | Jan 14/2011 | <0.20 | 12.7 | 31 | 0.167 | <0.05 |
| ANCOL-076 | Raglan B | Jan 24/2011 | <0.20 | <5.0 | 27 | 0.396 | <0.05 |
| ANCOL-022 | Raglan B | Feb 9/2011 | <0.20 | <5.0 | 45 | 0.245 | <0.05 |
| ANCOL-028 | Raglan B | March 7/2011 | <0.20 | <5.0 | 36 | 0.358 | <0.05 |
| ANCOL-034 | Raglan B | March 28/2011 | 0.40 | <5.0 | 34 | 0.051 | <0.05 |
| ANCOL-040 | Raglan B | April 13/2011 | <0.20 | 1.6 | 35 | 0.513 | <0.05 |
| ANCOL-046 | Raglan B | May 11/2011 | <0.20 | <5.0 | 33 | 0.255 | <0.05 |
| ANCOL-052 | Raglan B | June 8/2011 | <0.20 | 1.7 | 25 | 0.206 | <0.05 |
| ANCOL-058 | Raglan B | July 8/2011 | <0.20 | 2.3 | 42 | 0.166 | <0.05 |
| ANCOL-064 | Raglan B | Dec 9/2011 | <0.20 | 7.0 | 34 | 0.075 | <0.05 |
| ANCOL-006 | Tal/T7 B | Nov 29/2010 | <0.20 | 12.4 | 29 | <0.005 | <0.05 |
| ANCOL-008 | Tal/T7 B | Dec 20/2010 | <0.20 | 17.4 | 27 | <0.005 | <0.05 |
| ANCOL-068 | Tal/T7 B | Dec 30/2010 | <0.20 | 15.4 | 29 | 0.006 | <0.05 |
| ANCOL-014 | Tal/T7 B | Jan 14/2011 | <0.20 | 14.6 | 38 | 0.005 | <0.05 |
| ANCOL-074 | Tal/T7 B | Jan 24/2011 | <0.20 | 10.1 | 23 | 0.015 | <0.05 |
| ANCOL-020 | Tal/T7 B | Feb 9/2011 | <0.20 | 22.8 | 38 | 0.009 | <0.05 |
| ANCOL-056 | Tal/T7 B | July 8/2011 | <0.20 | 16.3 | 25 | 0.023 | <0.05 |
| ANCOL-026 | Tal/T7 B | March 7/2011 | <0.20 | 16.2 | 28 | 0.008 | <0.05 |
| ANCOL-032 | Tal/T7 B | March 28/2011 | <0.20 | 9.2 | 28 | <0.005 | <0.05 |
| ANCOL-038 | Tal/T7 B | April 13/2011 | <0.20 | 22.1 | 30 | <0.005 | <0.05 |
| ANCOL-044 | Tal/T7 B | May 11/2011 | 0.20 | 11.9 | 30 | <0.005 | <0.05 |
| ANCOL-050 | Tal/T7 B | June 8/2011 | <0.20 | 13.8 | 41 | <0.005 | <0.05 |
| ANCOL-062 | Tal/T7 B | Dec 9/2011 | <0.20 | 14.5 | 32 | <0.005 | <0.05 |
| ANCOL-002 | Tal/T7 B | Oct 11/2010 | <0.20 | 161.0 | 35 | <0.005 | <0.05 |
| ANCOL-004 | Tal/T7 B | Nov 4/2010 | <0.20 | 192.0 | 32 | <0.005 | <0.05 |

**All anion concentrations in are mg/L.

| Sampling port | Sample number | pH | Eh (mV) | Conductivity (uS/cm) |
|---|---|---|---|---|
| Talbot/T7 A Effluent | 1 | 7.1 | 221 | 2531 |
| Talbot/T7 A Effluent | 2 | 5.8 | 98 | 480 |
| Talbot/T7 A Effluent | 3 | 7.4 | 217 | 879 |
| Talbot/T7 A Effluent | 4 | 7.2 | | 418 |
| Talbot/T7 A Effluent | 5 | 7.4 | | 488 |
| Talbot/T7 A Effluent | 6 | 7.5 | 210 | 398 |
| Talbot/T7 A Effluent | 7 | 7.7 | 250 | 333 |
| Talbot/T7 A Effluent | 8 | 8.0 | 230 | 358 |
| Talbot/T7 A Effluent | 9 | 7.8 | 180 | 346 |
| Talbot/T7 A Effluent | 10 | 8.0 | 184 | 307 |
| Talbot/T7 A Effluent | 11 | 7.9 | 170 | 310 |
| Talbot/T7 A Effluent | 12 | 8.3 | 139 | 314 |
| Talbot/T7 A Effluent | 13 | 8.0 | 194 | 377 |
| Talbot/T7 A Effluent | 14 | 8.1 | 240 | 275 |
| Talbot/T7 A Effluent | 15 | 7.7 | 253 | 453 |
| Talbot/T7 A Effluent | 16 | 8.0 | 259 | 615 |
| Talbot/T7 A Effluent | 17 | 8.0 | 234 | 592 |
| Talbot/T7 A Effluent | 18 | 7.9 | 215 | 468 |
| Talbot/T7 A Effluent | 19 | 8.0 | 243 | 345 |
| Talbot/T7 A Effluent | 20 | 7.8 | 241 | 404 |
| Talbot/T7 A Effluent | 21 | 8.1 | 254 | 379 |
| Talbot/T7 A Effluent | 22 | 7.9 | 210 | 335 |
| Talbot/T7 A Effluent | 23 | 8.1 | 283 | 282 |
| Talbot/T7 A Effluent | 24 | 7.5 | 223 | |
| Talbot/T7 A Effluent | 25 | 8.0 | 219 | 290 |
| Talbot/T7 A Effluent | 26 | 7.7 | 283 | 347 |
| Talbot/T7 A Effluent | 27 | 7.6 | 294 | 290 |
| Talbot/T7 A Effluent | 28 | 8.1 | 336 | 309 |
| Talbot/T7 A Effluent | 29 | 8.3 | 340 | 240 |
| Talbot/T7 A Effluent | 30 | 8.2 | 243 | 314 |
| Talbot/T7 B Effluent | 1 | 6.3 | 126 | 2395 |
| Talbot/T7 B Effluent | 2 | 5.8 | 136 | 568 |
| Talbot/T7 B Effluent | 3 | 6.8 | 232 | 914 |
| Talbot/T7 B Effluent | 4 | 6.8 | 180 | 506 |
| Talbot/T7 B Effluent | 5 | 7.0 | 180 | 552 |
| Talbot/T7 B Effluent | 6 | 7.2 | 206 | 398 |
| Talbot/T7 B Effluent | 7 | 7.0 | 265 | 339 |
| Talbot/T7 B Effluent | 8 | 7.4 | 265 | 358 |
| Talbot/T7 B Effluent | 9 | 7.6 | 205 | 355 |
| Talbot/T7 B Effluent | 10 | 7.6 | 192 | 310 |
| Talbot/T7 B Effluent | 11 | 7.6 | 163 | 305 |
| Talbot/T7 B Effluent | 12 | 8.0 | 144 | 314 |
| Talbot/T7 B Effluent | 13 | 7.7 | 231 | 357 |
| Talbot/T7 B Effluent | 14 | 7.6 | 318 | 296 |
| Talbot/T7 B Effluent | 15 | 7.9 | 284 | 447 |
| Talbot/T7 B Effluent | 16 | 7.6 | 270 | 615 |
| Talbot/T7 B Effluent | 17 | 7.7 | 223 | 602 |
| Talbot/T7 B Effluent | 18 | 7.5 | 238 | 491 |

| Sampling port | Sample number | pH | Eh (mV) | Conductivity (uS/cm) |
|---|---|---|---|---|
| Talbot/T7 B Effluent | 19 | 7.6 | 252 | 345 |
| Talbot/T7 B Effluent | 20 | 7.4 | 271 | 399 |
| Talbot/T7 B Effluent | 21 | 7.4 | 220 | 401 |
| Talbot/T7 B Effluent | 22 | 7.3 | 219 | 348 |
| Talbot/T7 B Effluent | 23 | 7.8 | 298 | 276 |
| Talbot/T7 B Effluent | 24 | 7.3 | 258 | |
| Talbot/T7 B Effluent | 25 | 7.7 | 239 | 278 |
| Talbot/T7 B Effluent | 26 | 7.8 | 274 | 312 |
| Talbot/T7 B Effluent | 27 | 7.4 | 296 | 280 |
| Talbot/T7 B Effluent | 28 | 8.0 | 346 | 307 |
| Talbot/T7 B Effluent | 29 | 8.3 | 332 | 229 |
| Talbot/T7 B Effluent | 30 | 7.9 | 234 | 335 |
| Talbot/T7 A Carbonate | 7 | 8.3 | 225 | 401 |
| Talbot/T7 A Carbonate | 8 | 8.7 | 141 | 411 |
| Talbot/T7 A Carbonate | 9 | 8.9 | 170 | 363 |
| Talbot/T7 A Carbonate | 10 | 8.8 | 174 | 328 |
| Talbot/T7 A Carbonate | 11 | 8.9 | 145 | 335 |
| Talbot/T7 A Carbonate | 12 | 9.0 | 116 | 330 |
| Talbot/T7 A Carbonate | 13 | 9.3 | 162 | 318 |
| Talbot/T7 A Carbonate | 15 | 9.0 | 203 | 456 |
| Talbot/T7 A Carbonate | 17 | 8.4 | 199 | 499 |
| Talbot/T7 A Carbonate | 19 | 8.9 | 166 | 326 |
| Talbot/T7 A Carbonate | 21 | 8.9 | 228 | 351 |
| Talbot/T7 A Carbonate | 23 | 9.0 | 198 | 267 |
| Talbot/T7 A Carbonate | 25 | 8.9 | 158 | 326 |
| Talbot/T7 A Carbonate | 27 | 8.7 | 260 | 271 |
| Talbot/T7 A Carbonate | 30 | 9.0 | 186 | 284 |
| Talbot/T7 B Carbonate | 7 | 8.3 | 241 | 342 |
| Talbot/T7 B Carbonate | 8 | 8.6 | 160 | 355 |
| Talbot/T7 B Carbonate | 9 | 8.6 | 171 | 336 |
| Talbot/T7 B Carbonate | 10 | 8.7 | 159 | 315 |
| Talbot/T7 B Carbonate | 11 | 8.6 | 156 | 316 |
| Talbot/T7 B Carbonate | 12 | 8.9 | 131 | 323 |
| Talbot/T7 B Carbonate | 13 | 8.8 | 181 | 302 |
| Talbot/T7 B Carbonate | 15 | 8.8 | 193 | 505 |
| Talbot/T7 B Carbonate | 17 | 8.1 | 230 | 532 |
| Talbot/T7 B Carbonate | 19 | 8.9 | 116 | 333 |
| Talbot/T7 B Carbonate | 21 | 8.8 | 200 | 361 |
| Talbot/T7 B Carbonate | 23 | 8.9 | 208 | 282 |
| Talbot/T7 B Carbonate | 25 | 8.8 | 147 | 344 |
| Talbot/T7 B Carbonate | 27 | 8.6 | 240 | 277 |
| Talbot/T7 B Carbonate | 30 | 8.6 | 185 | 359 |
| Talbot/T7 A Ore | 7 | 8.2 | 245 | 278 |
| Talbot/T7 A Ore | 8 | 8.3 | 130 | 288 |
| Talbot/T7 A Ore | 9 | 8.6 | 183 | 266 |
| Talbot/T7 A Ore | 10 | 8.7 | 170 | 258 |
| Talbot/T7 A Ore | 11 | 8.7 | 158 | 277 |
| Talbot/T7 A Ore | 12 | 8.9 | 127 | 277 |

| Sampling port | Sample number | pH | Eh (mV) | Conductivity (uS/cm) |
|---|---|---|---|---|
| Talbot/T7 A Ore | 13 | 8.7 | 209 | 300 |
| Talbot/T7 A Ore | 15 | 8.6 | 226 | 508 |
| Talbot/T7 A Ore | 17 | 8.5 | 200 | 469 |
| Talbot/T7 A Ore | 19 | 8.4 | 202 | 321 |
| Talbot/T7 A Ore | 21 | 8.7 | 236 | 359 |
| Talbot/T7 A Ore | 23 | 8.9 | 195 | 254 |
| Talbot/T7 A Ore | 25 | 8.7 | 179 | 311 |
| Talbot/T7 A Ore | 27 | 8.5 | 245 | 271 |
| Talbot/T7 A Ore | 30 | 8.8 | 211 | 260 |
| Talbot/T7 B Ore | 7 | 8.3 | 236 | 275 |
| Talbot/T7 B Ore | 8 | 8.6 | 135 | 285 |
| Talbot/T7 B Ore | 9 | 8.6 | 189 | 270 |
| Talbot/T7 B Ore | 10 | 8.5 | 164 | 249 |
| Talbot/T7 B Ore | 11 | 8.7 | 164 | 261 |
| Talbot/T7 B Ore | 12 | 9.0 | 124 | 270 |
| Talbot/T7 B Ore | 13 | 8.7 | 212 | 286 |
| Talbot/T7 B Ore | 15 | 8.7 | 223 | 520 |
| Talbot/T7 B Ore | 17 | 6.2 | 331 | 446 |
| Talbot/T7 B Ore | 19 | 6.2 | 331 | 226 |
| Talbot/T7 B Ore | 21 | 8.5 | 195 | 375 |
| Talbot/T7 B Ore | 23 | 8.8 | 176 | 276 |
| Talbot/T7 B Ore | 25 | 8.7 | 180 | 323 |
| Talbot/T7 B Ore | 27 | 8.4 | 244 | 283 |
| Talbot/T7 B Ore | 30 | 8.7 | 198 | 277 |
| Raglan A Effluent | 1 | 6.4 | 235 | 372 |
| Raglan A Effluent | 2 | 6.2 | 250 | 288 |
| Raglan A Effluent | 3 | 6.4 | 243 | 478 |
| Raglan A Effluent | 4 | 6.3 | 262 | 582 |
| Raglan A Effluent | 5 | 6.1 | 251 | 532 |
| Raglan A Effluent | 6 | 6.4 | 235 | 281 |
| Raglan A Effluent | 7 | 6.4 | 197 | 285 |
| Raglan A Effluent | 8 | 6.3 | 238 | 336 |
| Raglan A Effluent | 9 | 6.4 | 285 | 278 |
| Raglan A Effluent | 10 | 6.4 | 254 | 231 |
| Raglan A Effluent | 11 | 7.0 | 228 | 208 |
| Raglan A Effluent | 12 | 6.4 | 238 | |
| Raglan A Effluent | 13 | 6.8 | 229 | 223 |
| Raglan A Effluent | 14 | 6.8 | 237 | 236 |
| Raglan A Effluent | 15 | 6.2 | 287 | 227 |
| Raglan A Effluent | 16 | 6.9 | 554 | 316 |
| Raglan A Effluent | 17 | 7.3 | 246 | 203 |
| Raglan A Effluent | 18 | 7.0 | 201 | 220 |
| Raglan B Effluent | 1 | 6.2 | 220 | 336 |
| Raglan B Effluent | 2 | 6.3 | 210 | 416 |
| Raglan B Effluent | 3 | 6.2 | 248 | 496 |
| Raglan B Effluent | 4 | 6.3 | 251 | 516 |
| Raglan B Effluent | 5 | 6.0 | 252 | 585 |
| Raglan B Effluent | 6 | 6.4 | 190 | 322 |

| Sampling port | Sample number | pH | Eh (mV) | Conductivity (uS/cm) |
|---|---|---|---|---|
| Raglan B Effluent | 7 | 6.3 | 130 | 267 |
| Raglan B Effluent | 8 | 6.3 | 219 | 323 |
| Raglan B Effluent | 9 | 6.4 | 220 | 290 |
| Raglan B Effluent | 10 | 6.3 | 184 | 263 |
| Raglan B Effluent | 11 | 6.9 | 191 | 238 |
| Raglan B Effluent | 12 | 6.2 | 206 | |
| Raglan B Effluent | 13 | 6.5 | 239 | 247 |
| Raglan B Effluent | 14 | 6.3 | 292 | 245 |
| Raglan B Effluent | 15 | 6.4 | 270 | 223 |
| Raglan B Effluent | 16 | 7.2 | 215 | 307 |
| Raglan B Effluent | 17 | 6.9 | 214 | 279 |
| Raglan B Effluent | 18 | 6.5 | 249 | 232 |
| Raglan A Till | 1 | 6.9 | 300 | 364 |
| Raglan A Till | 3 | 6.8 | 281 | 535 |
| Raglan A Till | 5 | 5.9 | 298 | 509 |
| Raglan A Till | 7 | 7.6 | | |
| Raglan A Till | 9 | 7.0 | 366 | 278 |
| Raglan A Till | 11 | 6.6 | 360 | 249 |
| Raglan A Till | 13 | 6.5 | 268 | 259 |
| Raglan A Till | 15 | 6.7 | 357 | 232 |
| Raglan A Till | 18 | 6.8 | 312 | 244 |
| Raglan B Till | 1 | 7.1 | 300 | 449 |
| Raglan B Till | 3 | 6.6 | 247 | 647 |
| Raglan B Till | 5 | 6.4 | 319 | 492 |
| Raglan B Till | 7 | 7.6 | | |
| Raglan B Till | 9 | 7.4 | 323 | 211 |
| Raglan B Till | 11 | 7.3 | 339 | 215 |
| Raglan B Till | 13 | 6.8 | 242 | 223 |
| Raglan B Till | 15 | 6.4 | 350 | 215 |
| Raglan B Till | 18 | 6.6 | 304 | 246 |
| Raglan A Ore | 1 | 6.3 | 235 | 356 |
| Raglan A Ore | 3 | 6.6 | 202 | 375 |
| Raglan A Ore | 5 | 6.3 | 202 | 482 |
| Raglan A Ore | 7 | 6.8 | 123 | 285 |
| Raglan A Ore | 9 | 6.8 | 215 | 247 |
| Raglan A Ore | 11 | 7.2 | 197 | 228 |
| Raglan A Ore | 13 | 7.1 | 174 | 264 |
| Raglan A Ore | 15 | 6.8 | 181 | 240 |
| Raglan A Ore | 18 | 7.4 | 208 | 220 |
| Raglan B Ore | 1 | 6.6 | 170 | 452 |
| Raglan B Ore | 3 | 6.3 | 216 | 475 |
| Raglan B Ore | 5 | 6.7 | 159 | 459 |
| Raglan B Ore | 7 | 6.9 | 105 | 319 |
| Raglan B Ore | 9 | 7.2 | 185 | 282 |
| Raglan B Ore | 11 | 7.3 | 176 | 250 |
| Raglan B Ore | 13 | 7.4 | 158 | 248 |
| Raglan B Ore | 15 | 7.1 | 191 | 239 |
| Raglan B Ore | 18 | 7.4 | 194 | 230 |

| Sampling port | Sample number | pH | Eh (mV) | Conductivity (uS/cm) |
|---|---|---|---|---|
| LB/Arrieros A Effluent | 1 | 8.2 | 196 | 848 |
| LB/Arrieros A Effluent | 2 | 8.3 | 234 | 461 |
| LB/Arrieros A Effluent | 3 | 8.4 | 232 | 559 |
| LB/Arrieros A Effluent | 4 | 8.2 | 251 | 570 |
| LB/Arrieros A Effluent | 5 | 8.1 | 230 | 535 |
| LB/Arrieros A Effluent | 6 | 8.3 | 191 | 350 |
| LB/Arrieros A Effluent | 7 | 8.7 | 195 | 309 |
| LB/Arrieros A Effluent | 8 | 8.3 | 214 | 353 |
| LB/Arrieros A Effluent | 9 | 8.6 | 274 | 298 |
| LB/Arrieros A Effluent | 10 | 8.3 | 191 | 271 |
| LB/Arrieros A Effluent | 11 | 8.7 | 234 | 274 |
| LB/Arrieros A Effluent | 12 | 8.2 | 222 | |
| LB/Arrieros A Effluent | 13 | 8.5 | 189 | 264 |
| LB/Arrieros A Effluent | 14 | 8.6 | 245 | 303 |
| LB/Arrieros A Effluent | 15 | 8.5 | 287 | 273 |
| LB/Arrieros A Effluent | 16 | 8.1 | 354 | 326 |
| LB/Arrieros A Effluent | 17 | 8.8 | 312 | 231 |
| LB/Arrieros A Effluent | 18 | 8.7 | 203 | 237 |
| LB/Arrieros B Effluent | 1 | 8.4 | 210 | 741 |
| LB/Arrieros B Effluent | 2 | 8.2 | 235 | 516 |
| LB/Arrieros B Effluent | 3 | 8.4 | 242 | 589 |
| LB/Arrieros B Effluent | 4 | 8.4 | 254 | 562 |
| LB/Arrieros B Effluent | 5 | 8.2 | 244 | 542 |
| LB/Arrieros B Effluent | 6 | 8.2 | 200 | 377 |
| LB/Arrieros B Effluent | 7 | 8.5 | 212 | 312 |
| LB/Arrieros B Effluent | 8 | 8.4 | 259 | 344 |
| LB/Arrieros B Effluent | 9 | 8.6 | 250 | 306 |
| LB/Arrieros B Effluent | 10 | 8.2 | 195 | 279 |
| LB/Arrieros B Effluent | 11 | 8.6 | 252 | 278 |
| LB/Arrieros B Effluent | 12 | 8.0 | 240 | |
| LB/Arrieros B Effluent | 13 | 8.5 | 201 | 264 |
| LB/Arrieros B Effluent | 14 | 8.5 | 249 | 297 |
| LB/Arrieros B Effluent | 15 | 8.2 | 284 | 278 |
| LB/Arrieros B Effluent | 16 | 8.8 | 341 | 319 |
| LB/Arrieros B Effluent | 17 | 8.7 | 320 | 229 |
| LB/Arrieros B Effluent | 18 | 8.5 | 219 | 232 |
| LB/Arrieros A Gravel | 1 | 8.8 | 183 | 379 |
| LB/Arrieros A Gravel | 3 | 8.7 | 178 | 438 |
| LB/Arrieros A Gravel | 5 | 8.4 | 231 | 539 |
| LB/Arrieros A Gravel | 7 | 9.0 | 137 | 358 |
| LB/Arrieros A Gravel | 9 | 9.0 | 240 | 300 |
| LB/Arrieros A Gravel | 11 | 9.1 | 193 | 274 |
| LB/Arrieros A Gravel | 13 | 9.1 | 126 | 276 |
| LB/Arrieros A Gravel | 15 | 8.7 | 170 | 271 |
| LB/Arrieros A Gravel | 18 | 9.1 | 189 | 225 |
| LB/Arrieros B Gravel | 1 | 8.8 | 183 | 365 |
| LB/Arrieros B Gravel | 3 | 8.9 | 153 | 438 |
| LB/Arrieros B Gravel | 5 | 8.4 | 200 | 505 |

| Sampling port | Sample number | pH | Eh (mV) | Conductivity (uS/cm) |
|---|---|---|---|---|
| LB/Arrieros B Gravel | 7 | 9.0 | 141 | 343 |
| LB/Arrieros B Gravel | 9 | 9.0 | 220 | 292 |
| LB/Arrieros B Gravel | 11 | 9.1 | 196 | 265 |
| LB/Arrieros B Gravel | 13 | 9.1 | 116 | 264 |
| LB/Arrieros B Gravel | 15 | 8.7 | 153 | 263 |
| LB/Arrieros B Gravel | 18 | 9.2 | 160 | 223 |
| LB/Arrieros A Ore | 1 | 6.2 | 329 | 272 |
| LB/Arrieros A Ore | 3 | 6.0 | 302 | 435 |
| LB/Arrieros A Ore | 5 | 5.8 | 279 | 509 |
| LB/Arrieros A Ore | 7 | 5.9 | 260 | 326 |
| LB/Arrieros A Ore | 9 | 6.3 | 359 | 245 |
| LB/Arrieros A Ore | 11 | 6.4 | 270 | 278 |
| LB/Arrieros A Ore | 13 | 6.7 | 246 | 239 |
| LB/Arrieros A Ore | 15 | 6.4 | 358 | 228 |
| LB/Arrieros A Ore | 18 | 6.4 | 276 | 209 |
| LB/Arrieros B Ore | 1 | 6.7 | 302 | 264 |
| LB/Arrieros B Ore | 3 | 6.4 | 319 | 372 |
| LB/Arrieros B Ore | 5 | 6.2 | 331 | 446 |
| LB/Arrieros B Ore | 7 | 6.4 | 280 | 302 |
| LB/Arrieros B Ore | 9 | 7.3 | 334 | 233 |
| LB/Arrieros B Ore | 11 | 7.0 | 302 | 234 |
| LB/Arrieros B Ore | 13 | 7.4 | 248 | 209 |
| LB/Arrieros B Ore | 15 | 6.6 | 318 | 184 |
| LB/Arrieros B Ore | 18 | 6.8 | 273 | 206 |

| Sample ID | Sample Number | Ag 328.068 | Al 308.215 | Al 396.153 | As 188.979 | Au 267.595 | B 249.677 |
|---|---|---|---|---|---|---|---|
| Raglan A Effluent | 1 | bdl | 0.46 | 0.48 | bdl | bdl | 0.86 |
| Raglan A Effluent | 2 | bdl | 0.34 | 0.33 | bdl | bdl | 0.34 |
| Raglan A Effluent | 3 | bdl | 0.26 | 0.26 | 0.01 | bdl | 0.29 |
| Raglan A Effluent | 4 | bdl | 0.31 | 0.31 | bdl | bdl | 0.21 |
| Raglan A Effluent | 5 | bdl | 0.26 | 0.26 | bdl | bdl | 0.16 |
| Raglan A Effluent | 6 | bdl | 0.12 | 0.23 | bdl | bdl | 0.20 |
| Raglan A Effluent | 7 | bdl | 0.04 | 0.22 | 0.03 | bdl | 0.18 |
| Raglan A Effluent | 8 | bdl | 0.10 | 0.28 | 0.01 | bdl | 0.18 |
| Raglan A Effluent | 9 | bdl | 0.19 | 0.16 | bdl | bdl | 0.19 |
| Raglan A Effluent | 10 | bdl | 0.27 | 0.22 | bdl | bdl | 0.13 |
| Raglan A Effluent | 11 | bdl | 0.22 | 0.17 | 0.01 | bdl | 0.22 |
| Raglan A Effluent | 12 | bdl | 0.20 | 0.15 | bdl | bdl | 0.16 |
| Raglan A Effluent | 13 | 0.01 | 0.20 | 0.23 | bdl | bdl | 0.10 |
| Raglan A Effluent | 14 | bdl | 0.17 | 0.18 | 0.01 | bdl | 0.09 |
| Raglan A Effluent | 15 | bdl | 0.11 | 0.13 | bdl | bdl | 0.02 |
| Raglan A Effluent | 16 | bdl | 0.31 | 0.27 | 0.01 | bdl | 0.03 |
| Raglan A Effluent | 17 | bdl | 0.24 | 0.23 | 0.01 | bdl | 0.09 |
| Raglan A Effluent | 18 | bdl | 0.13 | 0.14 | bdl | bdl | 0.04 |
| Raglan A Effluent | 19 | bdl | 0.11 | 0.09 | bdl | bdl | 0.04 |
| Raglan A Effluent | 20 | bdl | 0.10 | 0.08 | bdl | bdl | 0.10 |
| Raglan A Effluent | 21 | bdl | 0.11 | 0.07 | bdl | bdl | 0.04 |
| Raglan A Effluent | 22 | bdl | 0.10 | 0.08 | bdl | bdl | 0.02 |
| Raglan A Effluent | 23 | bdl | 0.10 | 0.05 | bdl | bdl | 0.03 |
| Raglan A Effluent | 24 | 0.01 | 0.05 | 0.90 | 0.01 | bdl | 0.03 |
| Raglan A Effluent | 25 | bdl | 0.03 | bdl | bdl | bdl | 0.04 |
| Raglan A Effluent | 26 | bdl | 0.03 | bdl | 0.01 | bdl | 0.02 |
| Raglan A Ore | 3 | bdl | bdl | bdl | bdl | bdl | 0.47 |
| Raglan A Ore | 5 | bdl | bdl | bdl | bdl | bdl | 0.27 |
| Raglan A Ore | 7 | bdl | bdl | bdl | bdl | bdl | 0.33 |
| Raglan A Ore | 9 | bdl | 0.04 | 0.02 | bdl | bdl | 0.22 |
| Raglan A Ore | 11 | bdl | 0.06 | 0.01 | bdl | bdl | 0.24 |
| Raglan A Ore | 13 | bdl | 0.01 | 0.04 | 0.02 | bdl | 0.04 |
| Raglan A Ore | 15 | 0.01 | 0.01 | 0.02 | 0.01 | bdl | 0.08 |
| Raglan A Ore | 17 | 0.01 | 0.01 | 0.02 | bdl | bdl | 0.06 |
| Raglan A Ore | 23 | bdl | bdl | bdl | bdl | bdl | 0.06 |
| Raglan A Ore | 26 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Raglan A Till | 3 | bdl | 0.01 | bdl | bdl | bdl | 0.60 |
| Raglan A Till | 5 | bdl | bdl | bdl | bdl | bdl | 0.65 |
| Raglan A Till | 7 | bdl | bdl | bdl | bdl | bdl | 0.63 |
| Raglan A Till | 9 | bdl | 0.02 | 0.03 | bdl | bdl | 0.65 |
| Raglan A Till | 11 | bdl | 0.03 | bdl | bdl | bdl | 0.61 |
| Raglan A Till | 13 | 0.01 | 0.04 | 0.04 | 0.01 | bdl | 0.14 |
| Raglan A Till | 15 | 0.01 | 0.02 | 0.04 | bdl | bdl | 0.12 |
| Raglan A Till | 17 | 0.01 | 0.02 | 0.03 | 0.02 | bdl | 0.11 |
| Raglan A Till | 23 | bdl | 0.06 | 0.04 | 0.01 | bdl | 0.12 |
| Raglan A Till | 26 | bdl | 0.06 | bdl | bdl | bdl | 0.03 |
| Raglan B Effluent | 1 | bdl | 0.39 | 0.41 | bdl | bdl | 0.78 |
| Raglan B Effluent | 2 | bdl | 0.64 | 0.62 | bdl | bdl | 0.11 |
| Raglan B Effluent | 3 | bdl | 0.46 | 0.45 | 0.01 | bdl | 0.15 |
| Raglan B Effluent | 4 | bdl | 0.21 | 0.20 | bdl | bdl | 0.07 |
| Raglan B Effluent | 5 | bdl | 0.24 | 0.23 | bdl | bdl | 0.33 |
| Raglan B Effluent | 6 | bdl | 0.14 | 0.27 | 0.02 | bdl | 0.28 |

| Ba 455.403 | Be 313.042 | Ca 317.933 | Cd 226.502 | Cd 228.802 | Co 228.616 | Cr 267.716 | Cr 283.563 | Cu 324.752 |
|---|---|---|---|---|---|---|---|---|
| 0.75 | bdl | 116.28 | bdl | bdl | 2.26 | bdl | bdl | 0.01 |
| 0.67 | bdl | 22.08 | bdl | bdl | 0.38 | bdl | bdl | 0.05 |
| 0.74 | bdl | 19.61 | bdl | bdl | 0.32 | bdl | 0.01 | bdl |
| 0.60 | bdl | 18.93 | bdl | bdl | 0.25 | bdl | 0.01 | bdl |
| 0.63 | bdl | 20.00 | bdl | bdl | 0.24 | bdl | 0.01 | bdl |
| 0.70 | bdl | 19.99 | bdl | bdl | 0.18 | bdl | bdl | bdl |
| 0.61 | bdl | 17.20 | bdl | bdl | 0.15 | bdl | bdl | bdl |
| 0.56 | bdl | 12.81 | bdl | bdl | 0.06 | bdl | bdl | bdl |
| 0.66 | bdl | 11.61 | bdl | bdl | 0.08 | bdl | 0.01 | bdl |
| 0.13 | bdl | 13.54 | bdl | bdl | 0.08 | bdl | 0.02 | bdl |
| 0.67 | bdl | 10.13 | bdl | bdl | 0.05 | bdl | 0.02 | bdl |
| 0.14 | bdl | 10.14 | bdl | bdl | 0.04 | bdl | 0.02 | bdl |
| 0.03 | bdl | 8.50 | bdl | bdl | 0.03 | bdl | 0.01 | 0.02 |
| 0.13 | bdl | 7.46 | bdl | bdl | 0.03 | bdl | 0.01 | 0.00 |
| 0.03 | bdl | 7.97 | bdl | bdl | 0.02 | bdl | 0.01 | 0.01 |
| 0.18 | bdl | 7.61 | bdl | bdl | 0.02 | bdl | 0.02 | bdl |
| 0.39 | bdl | 6.44 | bdl | bdl | 0.01 | bdl | 0.01 | bdl |
| 0.10 | bdl | 6.90 | bdl | bdl | 0.01 | bdl | 0.01 | bdl |
| 0.08 | bdl | 6.72 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.37 | bdl | 5.29 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.09 | bdl | 6.18 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.02 | bdl | 4.65 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.02 | 0.01 | 5.00 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.01 | 0.08 | 1.24 | bdl | bdl | 0.01 | bdl | bdl | 0.04 |
| 0.02 | 0.01 | 3.84 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.02 | 0.01 | 3.67 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.52 | bdl | 1.57 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.43 | bdl | 0.81 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.51 | bdl | 0.99 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.55 | bdl | 1.02 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.41 | bdl | 1.42 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 2.04 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| bdl | bdl | 2.55 | bdl | bdl | bdl | bdl | bdl | bdl |
| bdl | bdl | 1.69 | bdl | bdl | 0.01 | bdl | bdl | 0.05 |
| bdl | 0.01 | 2.37 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| bdl | 0.01 | 4.94 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| 0.82 | bdl | 21.75 | bdl | bdl | 0.35 | bdl | bdl | 0.01 |
| 0.91 | bdl | 19.83 | bdl | bdl | 0.31 | bdl | bdl | bdl |
| 0.79 | bdl | 10.98 | bdl | bdl | 0.16 | bdl | bdl | bdl |
| 1.18 | bdl | 11.80 | bdl | bdl | 0.18 | bdl | bdl | bdl |
| 0.93 | bdl | 10.85 | bdl | bdl | 0.15 | bdl | 0.01 | bdl |
| 0.05 | bdl | 8.59 | bdl | bdl | 0.14 | bdl | bdl | 0.01 |
| 0.06 | bdl | 8.88 | bdl | bdl | 0.14 | bdl | bdl | 0.02 |
| 0.06 | bdl | 7.96 | bdl | bdl | 0.12 | bdl | bdl | 0.01 |
| 0.05 | 0.01 | 7.43 | bdl | bdl | 0.12 | bdl | bdl | 0.06 |
| 0.05 | 0.01 | 3.79 | bdl | bdl | 0.06 | bdl | bdl | 0.13 |
| 0.91 | bdl | 109.17 | bdl | bdl | 1.52 | bdl | bdl | 0.01 |
| 0.14 | bdl | 22.62 | bdl | bdl | 0.28 | bdl | 0.01 | bdl |
| 0.65 | bdl | 18.45 | bdl | bdl | 0.24 | bdl | 0.02 | bdl |
| 0.73 | bdl | 42.35 | bdl | bdl | 0.37 | bdl | 0.04 | bdl |
| 0.73 | bdl | 24.53 | bdl | bdl | 0.19 | bdl | 0.03 | bdl |
| 0.71 | bdl | 16.88 | bdl | bdl | 0.11 | bdl | bdl | bdl |

| Cu 327.393 | Fe 238.204 | Fe 239.562 | K 766.490 | Li 670.784 | Mg 285.213 | Mn 257.610 | Mn 259.372 | Mo 202.031 |
|---|---|---|---|---|---|---|---|---|
| bdl | 1.45 | 1.46 | 16.37 | 0.15 | 47.22 | 11.83 | 11.72 | 0.01 |
| 0.05 | 6.82 | 6.74 | 8.57 | 0.04 | 6.77 | 2.43 | 2.40 | bdl |
| bdl | 8.82 | 8.79 | 7.97 | 0.04 | 6.33 | 2.34 | 2.32 | bdl |
| bdl | 10.62 | 10.58 | 7.58 | 0.02 | 6.33 | 2.39 | 2.37 | bdl |
| bdl | 13.60 | 13.57 | 7.49 | 0.02 | 7.00 | 2.72 | 2.69 | bdl |
| bdl | 11.43 | 11.50 | 7.37 | 0.01 | 6.78 | 2.55 | 2.53 | 0.01 |
| bdl | 12.37 | 12.50 | 6.61 | 0.01 | 5.99 | 2.26 | 2.24 | bdl |
| 0.01 | 15.92 | 16.13 | 6.28 | 0.01 | 3.62 | 1.51 | 1.50 | bdl |
| bdl | 7.90 | 7.78 | 5.34 | 0.01 | 4.60 | 1.75 | 1.74 | bdl |
| bdl | 13.16 | 13.01 | 6.30 | 0.02 | 5.84 | 2.11 | 2.10 | bdl |
| bdl | 6.73 | 6.61 | 5.48 | 0.01 | 4.19 | 1.54 | 1.53 | bdl |
| bdl | 7.01 | 6.87 | 5.63 | 0.01 | 3.90 | 1.46 | 1.45 | bdl |
| 0.02 | 8.29 | 8.19 | 4.28 | 0.01 | 3.23 | 1.26 | 1.25 | 0.01 |
| bdl | 10.28 | 10.16 | 4.41 | 0.01 | 3.20 | 1.23 | 1.21 | 0.01 |
| 0.01 | 11.90 | 11.76 | 4.86 | 0.01 | 3.52 | 1.28 | 1.27 | bdl |
| bdl | 17.30 | 17.14 | 4.92 | 0.01 | 3.42 | 1.32 | 1.32 | bdl |
| bdl | 11.43 | 11.32 | 4.84 | 0.01 | 2.88 | 1.04 | 1.03 | bdl |
| bdl | 10.48 | 10.41 | 5.41 | 0.01 | 2.96 | 1.01 | 1.00 | bdl |
| bdl | 12.02 | 11.92 | 7.31 | 0.01 | 3.44 | 1.20 | 1.18 | bdl |
| bdl | 9.58 | 9.47 | 6.20 | 0.01 | 2.93 | 0.96 | 0.94 | bdl |
| bdl | 12.22 | 12.14 | 7.35 | 0.01 | 3.49 | 1.12 | 1.11 | bdl |
| bdl | 9.05 | 8.95 | 6.82 | 0.01 | 2.85 | 0.88 | 0.87 | bdl |
| bdl | 8.14 | 8.32 | 7.62 | 0.01 | 2.98 | 0.90 | 0.88 | bdl |
| bdl | 3.08 | 3.24 | 4.41 | 0.01 | 1.34 | 0.33 | 0.33 | bdl |
| bdl | 2.96 | 3.11 | 7.81 | 0.01 | 3.26 | 0.70 | 0.69 | bdl |
| bdl | 2.37 | 2.48 | 6.82 | 0.01 | 4.21 | 0.64 | 0.62 | bdl |
| bdl | 11.82 | 11.81 | 4.72 | 0.01 | 20.23 | 0.16 | 0.17 | bdl |
| bdl | 3.31 | 3.29 | 4.32 | 0.01 | 9.50 | 0.07 | 0.07 | bdl |
| bdl | 3.23 | 3.26 | 5.88 | bdl | 12.26 | 0.08 | 0.08 | bdl |
| bdl | 1.93 | 1.90 | 5.81 | 0.01 | 10.49 | 0.06 | 0.06 | bdl |
| bdl | 1.62 | 1.59 | 7.38 | 0.01 | 8.74 | 0.05 | 0.05 | bdl |
| bdl | 1.43 | 1.39 | 6.76 | bdl | 6.81 | 0.04 | 0.04 | bdl |
| bdl | 2.02 | 1.99 | 8.96 | bdl | 10.81 | 0.05 | 0.05 | bdl |
| 0.05 | 0.99 | 0.96 | 7.15 | bdl | 6.84 | 0.03 | 0.03 | bdl |
| bdl | 0.64 | 0.66 | 9.82 | bdl | 7.51 | 0.06 | 0.05 | bdl |
| 0.02 | 0.51 | 0.55 | 9.53 | bdl | 11.98 | 0.03 | 0.03 | bdl |
| bdl | 1.34 | 1.33 | 8.54 | 0.13 | 12.75 | 3.26 | 3.21 | bdl |
| bdl | 1.09 | 1.07 | 8.49 | 0.09 | 12.33 | 4.13 | 4.07 | bdl |
| bdl | 0.76 | 0.76 | 5.54 | 0.04 | 9.33 | 2.19 | 2.16 | bdl |
| bdl | 0.19 | 0.18 | 5.11 | 0.07 | 8.19 | 2.43 | 2.41 | bdl |
| bdl | 0.03 | 0.03 | 4.92 | 0.06 | 7.06 | 2.24 | 2.22 | bdl |
| 0.01 | 0.24 | 0.24 | 5.36 | 0.05 | 5.23 | 1.99 | 1.96 | bdl |
| 0.02 | 0.31 | 0.30 | 5.64 | 0.05 | 5.55 | 2.14 | 2.10 | bdl |
| 0.01 | 0.14 | 0.14 | 5.61 | 0.04 | 4.63 | 1.82 | 1.79 | bdl |
| 0.05 | 0.11 | 0.11 | 6.16 | 0.04 | 4.99 | 2.06 | 2.01 | bdl |
| 0.13 | 0.21 | 0.23 | 3.75 | 0.02 | 2.48 | 1.09 | 1.06 | bdl |
| bdl | 0.93 | 0.93 | 16.80 | 0.13 | 23.49 | 7.65 | 7.57 | 0.01 |
| bdl | 11.42 | 11.41 | 7.28 | 0.03 | 2.82 | 1.72 | 1.71 | bdl |
| bdl | 13.05 | 13.10 | 6.68 | 0.02 | 3.00 | 1.78 | 1.77 | bdl |
| bdl | 34.41 | 34.20 | 12.47 | 0.03 | 7.32 | 4.48 | 4.43 | bdl |
| bdl | 22.88 | 22.89 | 9.40 | 0.02 | 5.19 | 2.80 | 2.78 | bdl |
| bdl | 14.35 | 14.50 | 7.26 | 0.01 | 4.00 | 1.91 | 1.89 | bdl |

| Na 330.237 | Ni 231.604 | P 213.617 | Pb 220.353 | S 180.669 | Sb 206.836 | Se 196.026 | Si 212.412 | Si 251.611 |
|---|---|---|---|---|---|---|---|---|
| 13.67 | 85.06 | 0.07 | bdl | 183.15 | bdl | 0.09 | 26.39 | 26.70 |
| 13.60 | 14.98 | bdl | bdl | 28.42 | bdl | 0.03 | 16.45 | 16.71 |
| 18.26 | 12.99 | 0.13 | bdl | 25.69 | bdl | 0.02 | 17.80 | 18.14 |
| 16.71 | 10.43 | 0.16 | bdl | 25.05 | bdl | 0.02 | 17.52 | 17.87 |
| 16.51 | 9.69 | 0.16 | bdl | 26.22 | bdl | bdl | 19.30 | 19.83 |
| 16.91 | 7.73 | 0.11 | bdl | 25.14 | bdl | 0.01 | 18.89 | 19.25 |
| 15.36 | 6.33 | 0.11 | 0.01 | 17.80 | bdl | 0.03 | 18.57 | 19.04 |
| 11.17 | 3.24 | 0.44 | 0.01 | 3.48 | bdl | bdl | 15.83 | 16.02 |
| 15.29 | 3.87 | 0.13 | bdl | 11.95 | bdl | 0.01 | 17.37 | 17.47 |
| 14.43 | 4.11 | 0.27 | bdl | 7.53 | bdl | bdl | 19.30 | 19.40 |
| 15.30 | 2.87 | 0.16 | 0.01 | 5.60 | bdl | 0.01 | 18.62 | 18.70 |
| 13.55 | 2.24 | 0.21 | bdl | 4.54 | bdl | bdl | 18.33 | 18.38 |
| 12.36 | 1.95 | 0.36 | bdl | 1.53 | bdl | bdl | 15.88 | 16.02 |
| 14.09 | 1.62 | 0.49 | bdl | 0.86 | bdl | bdl | 13.71 | 13.76 |
| 16.91 | 1.24 | 0.48 | bdl | 1.21 | bdl | 0.01 | 11.89 | 11.96 |
| 15.97 | 1.36 | 0.82 | bdl | 0.94 | bdl | bdl | 11.64 | 11.88 |
| 17.53 | 0.83 | 0.76 | bdl | 1.38 | bdl | 0.01 | 13.47 | 13.55 |
| 14.26 | 0.64 | 0.62 | 0.01 | 1.23 | bdl | bdl | 12.63 | 12.72 |
| 15.40 | 0.72 | 0.60 | bdl | 0.80 | bdl | bdl | 12.93 | 12.95 |
| 15.87 | 0.50 | 0.52 | bdl | 1.11 | bdl | bdl | 12.13 | 12.33 |
| 14.90 | 0.47 | 0.64 | bdl | 0.71 | bdl | bdl | 12.01 | 12.03 |
| 14.59 | 0.44 | 0.64 | bdl | 0.59 | bdl | bdl | 12.03 | 12.05 |
| Sat | 0.38 | 0.64 | bdl | 0.61 | bdl | bdl | 13.89 | 14.23 |
| 9.40 | 0.12 | 0.30 | bdl | 0.68 | bdl | bdl | 7.18 | 7.62 |
| 19.15 | 0.27 | 0.18 | bdl | 0.88 | bdl | bdl | 10.31 | 10.55 |
| 16.90 | 0.18 | 0.18 | bdl | 0.57 | bdl | bdl | 4.70 | 4.94 |
| 18.46 | 2.38 | bdl | bdl | 30.04 | 0.01 | bdl | 20.20 | 20.83 |
| 13.89 | 1.02 | bdl | bdl | 15.28 | bdl | bdl | 18.38 | 18.88 |
| 19.39 | 0.55 | bdl | bdl | 25.11 | bdl | 0.02 | 18.36 | 18.67 |
| 19.36 | 0.38 | bdl | bdl | 14.08 | bdl | bdl | 17.96 | 18.07 |
| 17.04 | 0.17 | bdl | bdl | 12.41 | bdl | 0.01 | 17.85 | 17.85 |
| 15.07 | 0.12 | bdl | bdl | 8.98 | 0.01 | bdl | 13.82 | 13.94 |
| 18.05 | 0.11 | bdl | bdl | 14.51 | bdl | 0.01 | 15.24 | 15.38 |
| 14.28 | 0.40 | bdl | bdl | 10.60 | 0.01 | bdl | 13.84 | 13.94 |
| Sat | 0.18 | 0.01 | bdl | 8.46 | bdl | bdl | 14.14 | 14.59 |
| 18.36 | 0.09 | bdl | bdl | 18.37 | bdl | 0.01 | 13.27 | 13.71 |
| 20.70 | 16.18 | bdl | bdl | 43.08 | bdl | 0.05 | 23.54 | 24.13 |
| 21.98 | 13.87 | bdl | bdl | 42.74 | bdl | 0.04 | 25.84 | 26.22 |
| 20.82 | 8.09 | bdl | bdl | 27.91 | bdl | 0.03 | 19.18 | 19.93 |
| 20.86 | 8.31 | bdl | bdl | 30.94 | bdl | 0.01 | 20.11 | 20.54 |
| 20.09 | 7.13 | 0.01 | bdl | 25.84 | bdl | 0.02 | 19.79 | 20.01 |
| 15.08 | 5.88 | bdl | bdl | 21.95 | bdl | 0.03 | 18.26 | 18.33 |
| 15.58 | 6.11 | bdl | bdl | 19.76 | bdl | bdl | 18.30 | 18.38 |
| 15.18 | 5.03 | bdl | bdl | 18.92 | bdl | 0.02 | 17.45 | 17.55 |
| Sat | 4.83 | bdl | 0.03 | 16.66 | bdl | bdl | 18.61 | 19.21 |
| 15.83 | 2.28 | bdl | bdl | 6.09 | bdl | bdl | 7.80 | 8.03 |
| 16.09 | 68.53 | 0.07 | bdl | 140.56 | bdl | 0.05 | 23.36 | 23.89 |
| 12.38 | 15.26 | 0.22 | bdl | 21.61 | bdl | 0.03 | 13.28 | 13.55 |
| 18.56 | 12.45 | 0.22 | bdl | 17.15 | bdl | bdl | 12.55 | 12.87 |
| 24.84 | 15.96 | 0.15 | bdl | 61.80 | bdl | bdl | 20.16 | 20.60 |
| 13.19 | 8.62 | 0.25 | bdl | 25.95 | bdl | bdl | 20.59 | 21.24 |
| 13.85 | 5.17 | 0.32 | 0.01 | 9.27 | bdl | bdl | 18.77 | 19.13 |

| Sr 421.552 | Sr 460.733 | Ti 334.940 | Tl 190.801 | V 290.880 | Zn 206.200 | Zn 213.857 |
|---|---|---|---|---|---|---|
| 0.35 | 0.39 | bdl | bdl | 0.01 | 0.44 | 0.90 |
| 0.09 | 0.09 | bdl | bdl | bdl | 0.24 | 0.32 |
| 0.08 | 0.08 | bdl | bdl | 0.00 | 0.23 | 0.30 |
| 0.07 | 0.08 | 0.01 | bdl | 0.01 | 0.23 | 0.29 |
| 0.08 | 0.08 | 0.01 | bdl | 0.01 | 0.23 | 0.28 |
| 0.04 | 0.08 | 0.01 | bdl | bdl | 0.23 | 0.28 |
| 0.03 | 0.06 | 0.01 | bdl | bdl | 0.20 | 0.25 |
| 0.03 | 0.05 | 0.01 | 0.01 | bdl | 0.21 | 0.24 |
| 0.05 | 0.05 | 0.01 | bdl | bdl | 0.25 | 0.27 |
| 0.05 | 0.05 | 0.01 | bdl | bdl | 0.09 | 0.11 |
| 0.04 | 0.04 | 0.01 | bdl | bdl | 0.27 | 0.28 |
| 0.04 | 0.04 | 0.01 | bdl | bdl | 0.15 | 0.16 |
| 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.05 | 0.06 |
| 0.03 | 0.03 | 0.01 | bdl | 0.01 | 0.10 | 0.11 |
| 0.03 | 0.03 | 0.01 | bdl | bdl | 0.03 | 0.04 |
| 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.15 | 0.16 |
| 0.03 | 0.03 | 0.01 | bdl | 0.01 | 0.31 | 0.32 |
| 0.02 | 0.03 | 0.01 | bdl | bdl | 0.27 | 0.27 |
| 0.03 | 0.03 | 0.01 | bdl | bdl | 0.04 | 0.04 |
| 0.02 | 0.02 | 0.01 | 0.01 | bdl | 0.26 | 0.26 |
| 0.02 | 0.03 | 0.01 | bdl | bdl | 0.04 | 0.04 |
| 0.02 | 0.02 | 0.01 | bdl | bdl | 0.01 | 0.02 |
| 0.02 | 0.02 | 0.01 | 0.01 | 0.03 | 0.02 | 0.02 |
| 0.01 | 0.01 | bdl | 0.01 | 0.18 | bdl | 0.00 |
| 0.02 | 0.02 | bdl | 0.01 | 0.03 | 0.01 | 0.01 |
| 0.01 | 0.01 | bdl | bdl | 0.02 | 0.01 | 0.01 |
| 0.01 | 0.01 | bdl | 0.02 | 0.01 | 0.18 | 0.19 |
| bdl | 0.01 | bdl | bdl | bdl | 0.14 | 0.14 |
| bdl | 0.01 | bdl | bdl | bdl | 0.11 | 0.12 |
| 0.01 | 0.01 | bdl | bdl | bdl | 0.10 | 0.10 |
| 0.01 | 0.01 | bdl | bdl | bdl | 0.12 | 0.20 |
| bdl | bdl | bdl | 0.01 | 0.01 | 0.07 | 0.07 |
| bdl | bdl | bdl | bdl | bdl | 0.09 | 0.09 |
| bdl | bdl | bdl | 0.01 | bdl | 0.03 | 0.04 |
| bdl | bdl | bdl | bdl | 0.03 | 0.01 | 0.02 |
| bdl | bdl | bdl | 0.01 | 0.02 | bdl | 0.01 |
| 0.10 | 0.10 | bdl | bdl | bdl | 0.22 | 0.30 |
| 0.09 | 0.09 | bdl | bdl | 0.01 | 0.17 | 0.24 |
| 0.03 | 0.06 | bdl | bdl | bdl | 0.11 | 0.16 |
| 0.07 | 0.07 | bdl | bdl | bdl | 0.08 | 0.12 |
| 0.06 | 0.06 | bdl | bdl | bdl | 0.07 | 0.11 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.05 | 0.07 |
| 0.05 | 0.05 | bdl | bdl | bdl | 0.10 | 0.12 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.11 | 0.14 |
| 0.04 | 0.04 | bdl | bdl | 0.03 | 0.06 | 0.08 |
| 0.02 | 0.02 | bdl | 0.01 | 0.02 | 0.04 | 0.06 |
| 0.32 | 0.35 | bdl | bdl | 0.01 | 0.46 | 0.84 |
| 0.09 | 0.09 | 0.01 | bdl | bdl | 0.04 | 0.12 |
| 0.07 | 0.08 | 0.01 | bdl | bdl | 0.20 | 0.27 |
| 0.16 | 0.17 | bdl | bdl | 0.01 | 0.20 | 0.29 |
| 0.09 | 0.09 | 0.01 | bdl | 0.01 | 0.26 | 0.31 |
| 0.03 | 0.07 | 0.01 | bdl | bdl | 0.25 | 0.29 |

| Sample ID | Sample Number | Ag 328.068 | Al 308.215 | Al 396.153 | As 188.979 | Au 267.595 | B 249.677 |
|---|---|---|---|---|---|---|---|
| Raglan B Effluent | 7 | bdl | 0.01 | 0.19 | bdl | bdl | 0.26 |
| Raglan B Effluent | 8 | bdl | 0.11 | 0.28 | bdl | bdl | 0.21 |
| Raglan B Effluent | 9 | bdl | 0.24 | 0.21 | bdl | bdl | 0.17 |
| Raglan B Effluent | 10 | bdl | 0.23 | 0.20 | 0.01 | bdl | 0.10 |
| Raglan B Effluent | 11 | bdl | 0.31 | 0.26 | bdl | bdl | 0.16 |
| Raglan B Effluent | 12 | bdl | 0.25 | 0.18 | bdl | bdl | 0.07 |
| Raglan B Effluent | 13 | bdl | 0.23 | 0.24 | 0.02 | bdl | 0.01 |
| Raglan B Effluent | 14 | bdl | 0.20 | 0.24 | 0.02 | bdl | 0.07 |
| Raglan B Effluent | 15 | bdl | 0.11 | 0.16 | bdl | bdl | 0.06 |
| Raglan B Effluent | 16 | bdl | 0.11 | 0.13 | 0.02 | bdl | 0.32 |
| Raglan B Effluent | 17 | 0.01 | 0.13 | 0.15 | bdl | bdl | 0.18 |
| Raglan B Effluent | 18 | bdl | 0.17 | 0.19 | 0.01 | bdl | 0.07 |
| Raglan B Effluent | 19 | bdl | 0.09 | 0.07 | bdl | bdl | 0.03 |
| Raglan B Effluent | 20 | bdl | 0.12 | 0.10 | bdl | bdl | 0.07 |
| Raglan B Effluent | 21 | bdl | 0.07 | 0.03 | bdl | bdl | 0.02 |
| Raglan B Effluent | 22 | bdl | 0.07 | 0.05 | bdl | bdl | 0.02 |
| Raglan B Effluent | 23 | bdl | 0.08 | 0.06 | bdl | bdl | 0.01 |
| Raglan B Effluent | 24 | 0.01 | 0.06 | 0.15 | 0.01 | 0.01 | 0.02 |
| Raglan B Effluent | 25 | bdl | 0.04 | bdl | 0.01 | bdl | 0.03 |
| Raglan B Effluent | 26 | bdl | 0.01 | bdl | bdl | bdl | 0.04 |
| Raglan B Ore | 3 | bdl | bdl | bdl | bdl | bdl | 0.87 |
| Raglan B Ore | 5 | bdl | 0.01 | 0.01 | bdl | bdl | 0.41 |
| Raglan B Ore | 7 | bdl | bdl | bdl | 0.01 | bdl | 0.38 |
| Raglan B Ore | 9 | bdl | 0.05 | bdl | 0.01 | bdl | 0.45 |
| Raglan B Ore | 11 | bdl | 0.10 | bdl | bdl | bdl | 0.42 |
| Raglan B Ore | 13 | 0.01 | bdl | 0.04 | bdl | bdl | 0.19 |
| Raglan B Ore | 15 | 0.01 | bdl | 0.01 | 0.01 | bdl | 0.09 |
| Raglan B Ore | 17 | 0.01 | bdl | 0.02 | bdl | bdl | 0.08 |
| Raglan B Ore | 23 | bdl | bdl | bdl | bdl | bdl | 0.10 |
| Raglan B Ore | 26 | bdl | bdl | bdl | bdl | bdl | 0.10 |
| Raglan B Till | 3 | bdl | bdl | 0.01 | bdl | bdl | 0.93 |
| Raglan B Till | 5 | bdl | bdl | bdl | bdl | bdl | 0.66 |
| Raglan B Till | 7 | bdl | bdl | bdl | bdl | bdl | 0.59 |
| Raglan B Till | 9 | bdl | bdl | bdl | bdl | bdl | 0.54 |
| Raglan B Till | 11 | bdl | 0.06 | 0.01 | bdl | bdl | 0.58 |
| Raglan B Till | 13 | 0.01 | bdl | 0.04 | bdl | bdl | 0.09 |
| Raglan B Till | 15 | 0.01 | 0.01 | 0.03 | bdl | bdl | 0.11 |
| Raglan B Till | 17 | 0.01 | 0.01 | 0.02 | bdl | bdl | 0.11 |
| Raglan B Till | 23 | bdl | 0.01 | bdl | 0.01 | bdl | 0.14 |
| Raglan B Till | 26 | bdl | 0.12 | bdl | bdl | bdl | 0.08 |
| Arrieros/LB A Effluent | 1 | bdl | 0.01 | 0.01 | 0.03 | bdl | 3.61 |
| Arrieros/LB A Effluent | 2 | bdl | bdl | 0.01 | 0.04 | bdl | 2.89 |
| Arrieros/LB A Effluent | 3 | bdl | bdl | bdl | 0.01 | bdl | 1.37 |
| Arrieros/LB A Effluent | 4 | bdl | bdl | bdl | 0.06 | bdl | 1.00 |
| Arrieros/LB A Effluent | 5 | bdl | 0.01 | 0.02 | 0.04 | bdl | 0.72 |
| Arrieros/LB A Effluent | 6 | bdl | bdl | bdl | 0.03 | bdl | 0.52 |
| Arrieros/LB A Effluent | 7 | bdl | bdl | bdl | 0.03 | bdl | 0.57 |
| Arrieros/LB A Effluent | 8 | bdl | bdl | bdl | 0.01 | bdl | 0.51 |
| Arrieros/LB A Effluent | 9 | bdl | 0.02 | bdl | 0.03 | bdl | 0.41 |
| Arrieros/LB A Effluent | 10 | bdl | 0.04 | bdl | 0.01 | bdl | 0.40 |
| Arrieros/LB A Effluent | 11 | bdl | 0.07 | bdl | 0.02 | bdl | 0.46 |

| Ba 455.403 | Be 313.042 | Ca 317.933 | Cd 226.502 | Cd 228.802 | Co 228.616 | Cr 267.716 | Cr 283.563 | Cu 324.752 |
|---|---|---|---|---|---|---|---|---|
| 0.65 | bdl | 18.12 | bdl | bdl | 0.09 | bdl | bdl | bdl |
| 0.56 | bdl | 11.38 | bdl | bdl | 0.09 | bdl | bdl | bdl |
| 0.59 | bdl | 13.01 | bdl | bdl | 0.05 | bdl | 0.02 | bdl |
| 0.12 | bdl | 13.76 | bdl | bdl | 0.04 | bdl | 0.02 | 0.01 |
| 0.62 | bdl | 11.25 | bdl | bdl | 0.04 | bdl | 0.03 | bdl |
| 0.11 | bdl | 10.68 | bdl | bdl | 0.03 | bdl | 0.03 | bdl |
| 0.04 | bdl | 10.80 | bdl | bdl | 0.03 | bdl | 0.02 | 0.01 |
| 0.09 | bdl | 10.83 | bdl | bdl | 0.03 | bdl | 0.01 | bdl |
| 0.04 | bdl | 10.31 | bdl | bdl | 0.02 | bdl | 0.01 | 0.01 |
| 0.43 | bdl | 6.91 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.37 | bdl | 8.02 | bdl | bdl | 0.02 | bdl | bdl | bdl |
| 0.10 | bdl | 9.47 | bdl | bdl | 0.02 | bdl | 0.01 | 0.01 |
| 0.09 | bdl | 6.50 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.40 | bdl | 7.79 | bdl | bdl | 0.02 | bdl | bdl | bdl |
| 0.11 | bdl | 12.49 | bdl | bdl | 0.01 | bdl | 0.01 | bdl |
| 0.03 | bdl | 6.22 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.04 | 0.01 | 9.57 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.02 | 0.02 | 4.52 | bdl | bdl | 0.01 | bdl | bdl | 0.02 |
| 0.03 | 0.01 | 5.67 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.02 | 0.01 | 4.84 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.54 | bdl | 2.97 | bdl | bdl | 0.02 | bdl | 0.01 | bdl |
| 0.48 | bdl | 1.20 | bdl | bdl | 0.01 | bdl | bdl | bdl |
| 0.52 | bdl | 1.19 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.72 | bdl | 1.82 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.54 | bdl | 1.63 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 1.57 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| bdl | bdl | 1.21 | bdl | bdl | bdl | bdl | bdl | 0.03 |
| bdl | bdl | 1.08 | bdl | bdl | 0.01 | bdl | bdl | 0.03 |
| bdl | 0.01 | 1.22 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| bdl | 0.01 | 0.76 | bdl | bdl | bdl | bdl | bdl | 0.04 |
| 1.01 | bdl | 51.91 | bdl | bdl | 0.58 | bdl | bdl | 0.01 |
| 0.91 | bdl | 28.37 | bdl | bdl | 0.27 | bdl | bdl | bdl |
| 0.85 | bdl | 20.36 | bdl | bdl | 0.17 | bdl | bdl | bdl |
| 0.97 | bdl | 13.19 | bdl | bdl | 0.12 | bdl | bdl | bdl |
| 1.00 | bdl | 6.21 | bdl | bdl | 0.05 | bdl | 0.01 | bdl |
| 0.05 | bdl | 7.48 | bdl | bdl | 0.08 | bdl | bdl | 0.01 |
| 0.06 | bdl | 7.58 | bdl | bdl | 0.10 | bdl | bdl | 0.01 |
| 0.06 | bdl | 6.11 | bdl | bdl | 0.10 | bdl | bdl | 0.01 |
| 0.08 | 0.01 | 7.02 | bdl | bdl | 0.14 | bdl | bdl | 0.03 |
| 0.04 | 0.01 | 5.15 | bdl | bdl | 0.06 | bdl | bdl | 0.02 |
| 0.42 | bdl | 142.19 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.11 | bdl | 430.39 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.58 | bdl | 263.53 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.48 | bdl | 158.09 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.54 | bdl | 63.32 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.61 | bdl | 37.54 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.45 | bdl | 35.26 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 29.88 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.67 | bdl | 20.44 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.04 | bdl | 30.88 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.54 | bdl | 26.96 | bdl | bdl | bdl | bdl | 0.01 | bdl |

| Cu 327.393 | Fe 238.204 | Fe 239.562 | K 766.490 | Li 670.784 | Mg 285.213 | Mn 257.610 | Mn 259.372 | Mo 202.031 |
|---|---|---|---|---|---|---|---|---|
| bdl | 10.35 | 10.46 | 7.77 | 0.01 | 4.49 | 2.05 | 2.03 | bdl |
| 0.01 | 8.22 | 8.29 | 5.17 | 0.01 | 3.81 | 1.49 | 1.48 | bdl |
| bdl | 16.21 | 16.03 | 6.51 | 0.01 | 3.81 | 1.72 | 1.72 | bdl |
| 0.01 | 16.26 | 16.06 | 7.47 | 0.01 | 4.77 | 1.85 | 1.85 | bdl |
| bdl | 15.02 | 14.84 | 6.18 | 0.01 | 3.54 | 1.51 | 1.51 | bdl |
| bdl | 13.37 | 13.16 | 7.02 | 0.01 | 4.49 | 1.40 | 1.40 | bdl |
| 0.01 | 19.09 | 18.90 | 5.44 | 0.01 | 3.57 | 1.45 | 1.45 | 0.01 |
| bdl | 13.32 | 13.18 | 5.74 | 0.01 | 3.88 | 1.41 | 1.40 | bdl |
| 0.01 | 8.00 | 7.92 | 6.13 | 0.01 | 3.81 | 1.31 | 1.29 | bdl |
| bdl | 1.95 | 1.91 | 5.65 | 0.01 | 2.91 | 0.91 | 0.89 | bdl |
| bdl | 5.51 | 5.43 | 5.22 | 0.01 | 3.25 | 1.13 | 1.11 | 0.01 |
| 0.01 | 16.53 | 16.42 | 5.73 | 0.01 | 3.92 | 1.29 | 1.28 | bdl |
| bdl | 11.44 | 11.35 | 7.39 | 0.01 | 3.42 | 0.96 | 0.94 | bdl |
| bdl | 11.55 | 11.43 | 6.72 | 0.01 | 3.56 | 1.16 | 1.14 | bdl |
| bdl | 15.83 | 15.75 | 11.93 | 0.02 | 7.01 | 1.81 | 1.79 | bdl |
| 0.01 | 6.78 | 6.64 | 8.04 | 0.01 | 3.24 | 0.92 | 0.90 | bdl |
| bdl | 9.37 | 9.57 | 8.98 | 0.01 | 4.61 | 1.41 | 1.38 | bdl |
| bdl | 4.86 | 5.08 | 7.82 | 0.01 | 3.01 | 0.74 | 0.72 | bdl |
| 0.01 | 2.98 | 3.13 | 8.45 | 0.01 | 3.56 | 0.82 | 0.80 | bdl |
| bdl | 1.57 | 1.64 | 6.83 | 0.01 | 3.40 | 0.62 | 0.61 | bdl |
| bdl | 28.41 | 28.16 | 2.75 | 0.02 | 45.82 | 0.43 | 0.46 | bdl |
| bdl | 6.83 | 6.77 | 2.95 | 0.01 | 16.67 | 0.15 | 0.15 | bdl |
| bdl | 2.32 | 2.34 | 5.32 | bdl | 12.93 | 0.08 | 0.08 | bdl |
| bdl | 2.69 | 2.64 | 5.03 | 0.01 | 18.57 | 0.10 | 0.10 | bdl |
| bdl | 2.05 | 2.01 | 5.11 | bdl | 17.19 | 0.09 | 0.09 | bdl |
| bdl | 2.03 | 1.99 | 5.04 | bdl | 13.50 | 0.07 | 0.07 | bdl |
| 0.03 | 1.67 | 1.64 | 6.35 | bdl | 11.17 | 0.06 | 0.06 | bdl |
| 0.03 | 0.99 | 0.97 | 6.51 | bdl | 8.54 | 0.04 | 0.04 | bdl |
| bdl | 0.86 | 0.88 | 9.03 | bdl | 10.57 | 0.04 | 0.04 | bdl |
| 0.04 | 0.54 | 0.58 | 7.33 | bdl | 11.33 | 0.04 | 0.04 | bdl |
| bdl | 0.22 | 0.22 | 13.57 | 0.10 | 17.13 | 4.98 | 4.91 | bdl |
| bdl | 0.10 | 0.10 | 9.30 | 0.06 | 7.73 | 3.00 | 2.95 | bdl |
| bdl | 0.03 | 0.03 | 7.27 | 0.03 | 5.49 | 2.37 | 2.33 | bdl |
| bdl | 0.02 | 0.02 | 5.19 | 0.04 | 4.30 | 1.81 | 1.79 | bdl |
| bdl | 0.02 | 0.02 | 3.47 | 0.03 | 2.29 | 0.78 | 0.77 | bdl |
| 0.01 | 0.04 | 0.04 | 4.92 | 0.03 | 2.67 | 1.35 | 1.32 | bdl |
| 0.01 | 0.33 | 0.33 | 5.51 | 0.03 | 4.35 | 1.76 | 1.72 | bdl |
| 0.01 | 0.25 | 0.25 | 5.53 | 0.04 | 4.87 | 1.76 | 1.73 | bdl |
| 0.02 | 0.50 | 0.52 | 7.67 | 0.04 | 5.86 | 2.33 | 2.27 | bdl |
| 0.02 | 0.86 | 0.90 | 4.95 | 0.03 | 4.38 | 1.63 | 1.58 | bdl |
| bdl | 0.01 | 0.01 | 24.39 | 0.65 | 6.30 | bdl | bdl | 0.10 |
| bdl | 0.03 | 0.03 | Sat | 0.84 | 14.27 | bdl | bdl | 0.12 |
| bdl | 0.02 | 0.02 | 24.61 | 0.36 | 8.52 | bdl | bdl | 0.10 |
| bdl | 0.01 | 0.01 | 17.61 | 0.21 | 1.86 | bdl | bdl | 0.09 |
| bdl | 0.01 | 0.01 | 11.24 | 0.17 | 0.80 | bdl | bdl | 0.11 |
| bdl | 0.01 | 0.01 | 13.45 | 0.06 | 0.91 | bdl | bdl | 0.10 |
| bdl | bdl | bdl | 11.79 | 0.07 | 0.66 | bdl | bdl | 0.08 |
| bdl | 0.01 | 0.01 | 12.41 | 0.06 | 0.85 | bdl | bdl | 0.08 |
| bdl | 0.01 | 0.01 | 15.82 | 0.09 | 0.72 | 0.01 | 0.01 | 0.08 |
| bdl | 0.01 | 0.01 | 18.04 | 0.12 | 0.97 | bdl | bdl | 0.07 |
| bdl | 0.01 | 0.01 | 15.16 | 0.14 | 0.71 | bdl | bdl | 0.08 |

| Na 330.237 | Ni 231.604 | P 213.617 | Pb 220.353 | S 180.669 | Sb 206.836 | Se 196.026 | Si 212.412 | Si 251.611 |
|---|---|---|---|---|---|---|---|---|
| 15.28 | 4.52 | 0.13 | bdl | 15.38 | bdl | 0.02 | 19.76 | 19.94 |
| 12.14 | 4.52 | 0.15 | 0.01 | 4.75 | bdl | 0.01 | 15.11 | 15.24 |
| 13.85 | 2.60 | 0.40 | 0.01 | 2.39 | bdl | bdl | 14.72 | 14.70 |
| 15.17 | 2.31 | 0.38 | bdl | 3.19 | bdl | bdl | 15.93 | 15.99 |
| 15.03 | 2.07 | 0.45 | bdl | 1.05 | bdl | 0.01 | 15.02 | 15.00 |
| 15.16 | 1.51 | 0.33 | bdl | 2.18 | bdl | bdl | 10.99 | 11.12 |
| 14.45 | 1.80 | 0.48 | 0.01 | 1.21 | bdl | 0.01 | 12.56 | 12.63 |
| 15.93 | 1.82 | 0.52 | bdl | 1.04 | bdl | bdl | 14.05 | 14.13 |
| 16.99 | 1.01 | 0.29 | bdl | 1.23 | 0.01 | 0.02 | 16.84 | 17.03 |
| 16.22 | 0.77 | 0.09 | 0.01 | 0.96 | bdl | 0.01 | 14.70 | 14.79 |
| 15.31 | 1.42 | 0.34 | bdl | 0.69 | bdl | bdl | 12.62 | 12.67 |
| 13.01 | 1.24 | 0.58 | 0.01 | 0.67 | bdl | bdl | 9.23 | 9.55 |
| 15.41 | 0.63 | 0.60 | bdl | 2.06 | bdl | bdl | 6.05 | 6.15 |
| 16.60 | 0.93 | 0.43 | bdl | 1.36 | bdl | bdl | 6.50 | 6.61 |
| 24.58 | 0.74 | 0.36 | 0.01 | 5.12 | bdl | bdl | 7.44 | 7.54 |
| 14.25 | 0.51 | 0.19 | bdl | 0.55 | bdl | bdl | 6.95 | 7.07 |
| Sat | 0.85 | 0.36 | bdl | 0.57 | bdl | bdl | 7.98 | 8.28 |
| 14.63 | 0.34 | 0.26 | bdl | 0.73 | bdl | bdl | 6.28 | 6.45 |
| 18.44 | 0.25 | 0.21 | bdl | 1.09 | bdl | bdl | 6.89 | 7.17 |
| 16.62 | 0.26 | 0.20 | bdl | 2.98 | bdl | bdl | 8.54 | 8.84 |
| 16.94 | 8.19 | bdl | bdl | 73.30 | bdl | 0.02 | 28.18 | 28.48 |
| 15.26 | 2.41 | bdl | bdl | 30.52 | bdl | 0.01 | 24.82 | 25.39 |
| 19.58 | 0.76 | bdl | bdl | 29.53 | bdl | 0.02 | 20.48 | 21.00 |
| 19.06 | 0.77 | bdl | bdl | 30.42 | bdl | 0.01 | 23.94 | 24.07 |
| 17.43 | 0.68 | 0.01 | 0.01 | 28.26 | bdl | 0.02 | 23.87 | 23.85 |
| 12.50 | 0.42 | bdl | bdl | 18.45 | bdl | 0.02 | 22.55 | 22.65 |
| 17.81 | 0.23 | bdl | bdl | 12.82 | bdl | 0.02 | 20.50 | 20.58 |
| 14.20 | 0.30 | bdl | 0.01 | 11.77 | bdl | 0.01 | 17.83 | 17.96 |
| Sat | 0.19 | bdl | bdl | 12.05 | bdl | bdl | 19.89 | 20.50 |
| 15.40 | 0.11 | bdl | bdl | 12.39 | bdl | 0.01 | 20.09 | 20.91 |
| 25.02 | 31.72 | bdl | bdl | 84.01 | bdl | 0.04 | 25.45 | 25.81 |
| 16.01 | 16.12 | 0.02 | bdl | 41.33 | bdl | 0.04 | 22.72 | 23.40 |
| 19.30 | 10.43 | bdl | bdl | 31.71 | bdl | 0.02 | 22.41 | 22.88 |
| 17.88 | 7.39 | bdl | bdl | 18.40 | bdl | bdl | 19.15 | 19.26 |
| 21.97 | 3.24 | 0.01 | bdl | 11.49 | bdl | 0.02 | 13.60 | 13.54 |
| 14.42 | 4.37 | bdl | 0.01 | 12.95 | 0.01 | bdl | 12.57 | 12.65 |
| 14.11 | 5.06 | bdl | bdl | 15.42 | bdl | 0.01 | 13.92 | 14.06 |
| 12.47 | 4.51 | bdl | bdl | 14.96 | 0.01 | 0.02 | 16.23 | 16.36 |
| Sat | 5.67 | bdl | bdl | 18.73 | bdl | bdl | 18.66 | 19.21 |
| 15.68 | 2.67 | 0.01 | bdl | 11.51 | bdl | bdl | 14.09 | 14.52 |
| 227.92 | 0.01 | bdl | 0.01 | 191.73 | 0.01 | 0.05 | 11.20 | 11.37 |
| 172.87 | bdl | bdl | 0.02 | 394.89 | bdl | 0.10 | 18.78 | 19.21 |
| 49.07 | bdl | bdl | 0.02 | 197.00 | 0.01 | 0.07 | 14.36 | 14.63 |
| 27.08 | bdl | 0.01 | bdl | 109.84 | bdl | 0.05 | 19.29 | 19.65 |
| 21.20 | bdl | bdl | bdl | 33.46 | bdl | 0.03 | 17.44 | 17.79 |
| 18.87 | bdl | bdl | 0.01 | 18.29 | bdl | 0.04 | 14.11 | 14.15 |
| 19.88 | bdl | bdl | bdl | 14.40 | bdl | 0.03 | 16.01 | 16.19 |
| 19.39 | bdl | bdl | bdl | 11.70 | bdl | 0.01 | 15.30 | 15.43 |
| 18.29 | bdl | bdl | bdl | 8.66 | bdl | 0.02 | 14.13 | 14.10 |
| 19.16 | bdl | bdl | bdl | 11.40 | bdl | 0.01 | 15.31 | 15.25 |
| 21.19 | bdl | bdl | bdl | 10.90 | bdl | 0.01 | 16.26 | 16.26 |

| Sr 421.552 | Sr 460.733 | Ti 334.940 | Tl 190.801 | V 290.880 | Zn 206.200 | Zn 213.857 |
|---|---|---|---|---|---|---|
| 0.04 | 0.07 | 0.01 | bdl | bdl | 0.22 | 0.25 |
| 0.02 | 0.04 | 0.01 | bdl | bdl | 0.30 | 0.34 |
| 0.05 | 0.05 | 0.01 | bdl | bdl | 0.22 | 0.24 |
| 0.05 | 0.05 | 0.01 | bdl | bdl | 0.08 | 0.09 |
| 0.05 | 0.05 | 0.01 | bdl | bdl | 0.26 | 0.28 |
| 0.04 | 0.04 | 0.01 | bdl | bdl | 0.09 | 0.10 |
| 0.04 | 0.04 | 0.02 | bdl | 0.01 | 0.05 | 0.06 |
| 0.04 | 0.04 | 0.01 | bdl | 0.01 | 0.10 | 0.11 |
| 0.04 | 0.04 | 0.01 | bdl | 0.01 | 0.03 | 0.03 |
| 0.03 | 0.03 | 0.01 | 0.01 | bdl | 0.34 | 0.35 |
| 0.03 | 0.03 | 0.01 | bdl | bdl | 0.27 | 0.28 |
| 0.04 | 0.04 | 0.01 | bdl | 0.01 | 0.19 | 0.19 |
| 0.03 | 0.03 | 0.01 | 0.01 | bdl | 0.05 | 0.05 |
| 0.03 | 0.03 | 0.01 | bdl | bdl | 0.34 | 0.34 |
| 0.05 | 0.05 | 0.01 | bdl | bdl | 0.06 | 0.07 |
| 0.02 | 0.03 | 0.01 | bdl | bdl | 0.02 | 0.02 |
| 0.04 | 0.04 | 0.01 | bdl | 0.03 | 0.01 | 0.02 |
| 0.02 | 0.03 | 0.01 | 0.02 | 0.08 | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | bdl | 0.03 | 0.01 | 0.02 |
| 0.02 | 0.02 | bdl | 0.01 | 0.02 | 0.01 | 0.01 |
| 0.01 | 0.01 | bdl | 0.03 | 0.01 | 0.30 | 0.35 |
| 0.01 | 0.01 | bdl | bdl | 0.01 | 0.15 | 0.16 |
| bdl | 0.01 | bdl | bdl | bdl | 0.13 | 0.14 |
| 0.01 | 0.01 | bdl | 0.01 | bdl | 0.12 | 0.12 |
| 0.01 | 0.01 | bdl | bdl | bdl | 0.15 | 0.15 |
| bdl | bdl | bdl | bdl | 0.01 | 0.07 | 0.07 |
| bdl | 0.01 | bdl | 0.01 | bdl | 0.05 | 0.05 |
| bdl | bdl | bdl | bdl | bdl | 0.03 | 0.03 |
| bdl | bdl | bdl | bdl | 0.03 | 0.01 | 0.01 |
| bdl | bdl | bdl | 0.01 | 0.02 | 0.01 | 0.01 |
| 0.18 | 0.19 | bdl | bdl | 0.01 | 0.14 | 0.30 |
| 0.11 | 0.11 | bdl | bdl | bdl | 0.09 | 0.17 |
| 0.05 | 0.09 | bdl | bdl | bdl | 0.06 | 0.12 |
| 0.07 | 0.07 | bdl | bdl | bdl | 0.06 | 0.10 |
| 0.05 | 0.05 | bdl | bdl | bdl | 0.05 | 0.06 |
| 0.04 | 0.03 | bdl | bdl | bdl | 0.05 | 0.07 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.05 | 0.07 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.06 | 0.08 |
| 0.04 | 0.04 | bdl | bdl | 0.03 | 0.05 | 0.08 |
| 0.03 | 0.02 | bdl | bdl | 0.02 | 0.08 | 0.10 |
| 0.69 | 0.85 | bdl | 0.01 | bdl | 0.10 | 0.11 |
| bdl | 1.71 | bdl | bdl | 0.01 | 0.12 | 0.13 |
| 0.93 | 1.01 | bdl | bdl | bdl | 0.11 | 0.12 |
| 0.39 | 0.43 | bdl | 0.01 | 0.02 | 0.06 | 0.06 |
| 0.18 | 0.19 | bdl | 0.02 | 0.02 | 0.08 | 0.09 |
| 0.08 | 0.16 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.07 | 0.13 | bdl | bdl | bdl | 0.02 | 0.03 |
| 0.06 | 0.12 | bdl | bdl | bdl | 0.05 | 0.05 |
| 0.11 | 0.11 | bdl | bdl | 0.01 | 0.02 | 0.02 |
| 0.14 | 0.14 | bdl | bdl | 0.01 | 0.03 | 0.03 |
| 0.12 | 0.12 | bdl | bdl | 0.01 | 0.04 | 0.04 |

| Sample ID | Sample Number | Ag 328.068 | Al 308.215 | Al 396.153 | As 188.979 | Au 267.595 | B 249.677 |
|---|---|---|---|---|---|---|---|
| Arrieros/LB A Effluent | 12 | bdl | 0.07 | bdl | 0.02 | bdl | 0.29 |
| Arrieros/LB A Effluent | 13 | 0.01 | bdl | 0.04 | 0.02 | bdl | 0.28 |
| Arrieros/LB A Effluent | 14 | 0.01 | 0.01 | 0.04 | 0.03 | bdl | 0.19 |
| Arrieros/LB A Effluent | 15 | bdl | 0.03 | 0.05 | 0.01 | bdl | 0.18 |
| Arrieros/LB A Effluent | 16 | 0.01 | 0.01 | bdl | 0.02 | bdl | 0.18 |
| Arrieros/LB A Effluent | 17 | 0.01 | 0.02 | 0.05 | 0.01 | bdl | 0.15 |
| Arrieros/LB A Effluent | 18 | 0.01 | 0.01 | 0.01 | 0.01 | bdl | 0.17 |
| Arrieros/LB A Effluent | 19 | bdl | 0.03 | bdl | bdl | bdl | 0.14 |
| Arrieros/LB A Effluent | 20 | bdl | 0.01 | bdl | bdl | bdl | 0.14 |
| Arrieros/LB A Effluent | 21 | bdl | 0.02 | bdl | 0.02 | bdl | 0.12 |
| Arrieros/LB A Effluent | 22 | bdl | 0.01 | bdl | 0.01 | bdl | 0.11 |
| Arrieros/LB A Effluent | 23 | bdl | bdl | bdl | 0.02 | bdl | 0.12 |
| Arrieros/LB A Effluent | 24 | 0.01 | bdl | 0.13 | bdl | 0.02 | 0.08 |
| Arrieros/LB A Effluent | 25 | bdl | bdl | bdl | 0.01 | bdl | 0.08 |
| Arrieros/LB A Effluent | 26 | bdl | bdl | bdl | 0.01 | bdl | 0.07 |
| Arrieros/LB A Gravel | 3 | bdl | bdl | bdl | bdl | bdl | 0.90 |
| Arrieros/LB A Gravel | 5 | bdl | bdl | bdl | bdl | bdl | 0.65 |
| Arrieros/LB A Gravel | 7 | bdl | bdl | bdl | 0.02 | bdl | 0.50 |
| Arrieros/LB A Gravel | 9 | bdl | 0.02 | bdl | 0.01 | bdl | 0.46 |
| Arrieros/LB A Gravel | 11 | bdl | 0.06 | bdl | 0.01 | bdl | 0.44 |
| Arrieros/LB A Gravel | 13 | bdl | bdl | 0.03 | 0.01 | bdl | 0.28 |
| Arrieros/LB A Gravel | 15 | 0.01 | 0.01 | 0.03 | 0.01 | bdl | 0.26 |
| Arrieros/LB A Gravel | 17 | 0.01 | 0.01 | 0.03 | 0.04 | bdl | 0.21 |
| Arrieros/LB A Gravel | 23 | bdl | 0.01 | bdl | 0.01 | bdl | 0.19 |
| Arrieros/LB A Gravel | 26 | bdl | bdl | bdl | bdl | bdl | 0.06 |
| Arrieros/LB A Ore | 3 | bdl | bdl | bdl | bdl | bdl | 0.72 |
| Arrieros/LB A Ore | 5 | bdl | 0.01 | bdl | bdl | bdl | 0.55 |
| Arrieros/LB A Ore | 7 | bdl | bdl | bdl | 0.01 | bdl | 0.51 |
| Arrieros/LB A Ore | 9 | bdl | 0.04 | 0.01 | 0.01 | bdl | 0.32 |
| Arrieros/LB A Ore | 11 | bdl | 0.06 | bdl | 0.01 | bdl | 0.41 |
| Arrieros/LB A Ore | 13 | 0.01 | 0.01 | 0.03 | 0.02 | bdl | 0.16 |
| Arrieros/LB A Ore | 15 | 0.01 | 0.01 | 0.04 | bdl | bdl | 0.13 |
| Arrieros/LB A Ore | 17 | 0.01 | 0.02 | 0.02 | bdl | bdl | 0.10 |
| Arrieros/LB A Ore | 23 | bdl | bdl | bdl | bdl | bdl | 0.06 |
| Arrieros/LB A Ore | 26 | bdl | bdl | bdl | bdl | bdl | 0.03 |
| Arrieros/LB B Effluent | 1 | bdl | bdl | 0.02 | bdl | bdl | 3.90 |
| Arrieros/LB B Effluent | 2 | bdl | bdl | bdl | 0.02 | bdl | 2.18 |
| Arrieros/LB B Effluent | 3 | bdl | bdl | bdl | 0.02 | bdl | 1.57 |
| Arrieros/LB B Effluent | 4 | bdl | bdl | bdl | 0.04 | bdl | 0.99 |
| Arrieros/LB B Effluent | 5 | bdl | bdl | bdl | 0.03 | bdl | 0.76 |
| Arrieros/LB B Effluent | 6 | bdl | bdl | bdl | 0.04 | bdl | 0.65 |
| Arrieros/LB B Effluent | 7 | bdl | bdl | 0.01 | 0.03 | bdl | 0.51 |
| Arrieros/LB B Effluent | 8 | bdl | bdl | 0.01 | 0.03 | bdl | 0.48 |
| Arrieros/LB B Effluent | 9 | bdl | 0.03 | bdl | 0.03 | bdl | 0.50 |
| Arrieros/LB B Effluent | 10 | bdl | 0.04 | 0.01 | 0.02 | bdl | 0.41 |
| Arrieros/LB B Effluent | 11 | bdl | 0.05 | bdl | 0.02 | bdl | 0.44 |
| Arrieros/LB B Effluent | 12 | bdl | 0.06 | bdl | 0.01 | bdl | 0.30 |
| Arrieros/LB B Effluent | 13 | bdl | 0.00 | 0.01 | 0.02 | bdl | 0.26 |
| Arrieros/LB B Effluent | 14 | bdl | 0.01 | 0.03 | 0.02 | bdl | 0.22 |
| Arrieros/LB B Effluent | 15 | 0.01 | 0.01 | 0.03 | bdl | bdl | 0.19 |
| Arrieros/LB B Effluent | 16 | 0.01 | 0.01 | 0.02 | 0.02 | bdl | 0.18 |
| Arrieros/LB B Effluent | 17 | 0.01 | 0.01 | bdl | 0.04 | bdl | 0.15 |

| Ba 455.403 | Be 313.042 | Ca 317.933 | Cd 226.502 | Cd 228.802 | Co 228.616 | Cr 267.716 | Cr 283.563 | Cu 324.752 |
|---|---|---|---|---|---|---|---|---|
| 0.05 | bdl | 24.61 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.02 | bdl | 23.82 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 20.56 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 19.73 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 19.31 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 19.82 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 17.88 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 20.20 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 19.10 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 18.93 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 14.47 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 17.97 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.00 | 0.02 | 10.78 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| 0.01 | 0.01 | 16.41 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 22.50 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 25.41 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.56 | bdl | 16.00 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.63 | bdl | 18.06 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.58 | bdl | 14.19 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.58 | bdl | 15.94 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 14.86 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 14.91 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.02 | bdl | 16.93 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 17.08 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | 0.01 | 13.82 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.83 | bdl | 3.91 | bdl | bdl | bdl | bdl | bdl | 2.05 |
| 0.63 | bdl | 4.08 | bdl | bdl | 0.01 | bdl | bdl | 1.11 |
| 0.69 | bdl | 4.96 | bdl | bdl | 0.01 | bdl | bdl | 0.55 |
| 0.67 | bdl | 4.35 | bdl | bdl | 0.01 | bdl | 0.01 | 0.44 |
| 0.70 | bdl | 4.37 | bdl | bdl | 0.01 | bdl | 0.01 | 0.34 |
| 0.04 | bdl | 4.00 | bdl | bdl | 0.01 | bdl | bdl | 0.82 |
| 0.04 | bdl | 4.69 | bdl | bdl | 0.01 | bdl | bdl | 0.65 |
| 0.04 | bdl | 3.85 | bdl | bdl | 0.01 | bdl | bdl | 0.54 |
| 0.04 | bdl | 3.30 | bdl | bdl | bdl | bdl | bdl | 0.38 |
| 0.08 | 0.01 | 5.25 | bdl | bdl | bdl | bdl | bdl | 0.07 |
| 0.48 | bdl | 199.09 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.37 | bdl | 153.72 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 209.03 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.46 | bdl | 179.42 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.52 | bdl | 78.30 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.54 | bdl | 41.12 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.53 | bdl | 32.49 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 28.59 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.64 | bdl | 23.20 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.05 | bdl | 29.05 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.53 | bdl | 27.45 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.04 | bdl | 26.48 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 24.06 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 23.33 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 22.48 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 21.00 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 19.32 | bdl | bdl | bdl | bdl | bdl | bdl |

| Cu 327.393 | Fe 238.204 | Fe 239.562 | K 766.490 | Li 670.784 | Mg 285.213 | Mn 257.610 | Mn 259.372 | Mo 202.031 |
|---|---|---|---|---|---|---|---|---|
| bdl | 0.01 | 0.01 | 18.93 | 0.10 | 0.82 | bdl | bdl | 0.07 |
| bdl | 0.01 | 0.01 | 14.56 | 0.11 | 0.66 | bdl | bdl | 0.07 |
| bdl | 0.01 | 0.01 | 18.21 | 0.07 | 0.74 | bdl | bdl | 0.07 |
| 0.01 | 0.01 | 0.01 | 17.90 | 0.07 | 0.72 | bdl | bdl | 0.08 |
| bdl | 0.01 | 0.01 | 17.24 | 0.07 | 0.65 | bdl | bdl | 0.08 |
| 0.01 | 0.05 | 0.05 | 18.58 | 0.06 | 0.86 | bdl | 0.01 | 0.07 |
| bdl | 0.01 | 0.01 | 15.93 | 0.07 | 0.63 | bdl | bdl | 0.07 |
| bdl | 0.01 | 0.01 | 18.80 | 0.08 | 0.75 | bdl | bdl | 0.07 |
| bdl | 0.01 | bdl | 18.20 | 0.08 | 0.74 | bdl | bdl | 0.07 |
| bdl | 0.01 | 0.01 | 18.15 | 0.07 | 0.90 | bdl | bdl | 0.07 |
| bdl | bdl | bdl | 14.90 | 0.05 | 0.74 | 0.01 | 0.01 | 0.07 |
| bdl | bdl | bdl | 16.89 | 0.07 | 0.96 | bdl | bdl | 0.09 |
| bdl | bdl | bdl | 13.07 | 0.04 | 0.60 | bdl | bdl | 0.05 |
| bdl | bdl | bdl | 12.11 | 0.04 | 1.05 | 0.01 | 0.01 | 0.06 |
| bdl | bdl | bdl | 12.06 | 0.04 | 1.81 | 0.03 | 0.03 | 0.03 |
| bdl | 0.01 | 0.01 | 32.54 | 0.13 | 2.53 | bdl | bdl | 0.09 |
| bdl | 0.01 | 0.01 | 36.47 | 0.07 | 1.67 | bdl | bdl | 0.08 |
| bdl | 0.00 | bdl | 40.12 | 0.04 | 1.77 | 0.01 | 0.01 | 0.07 |
| bdl | 0.01 | 0.01 | 34.03 | 0.05 | 1.39 | 0.01 | 0.01 | 0.06 |
| bdl | 0.00 | 0.01 | 33.68 | 0.05 | 1.70 | 0.01 | 0.01 | 0.07 |
| bdl | 0.03 | 0.03 | 26.02 | 0.03 | 1.58 | 0.01 | 0.01 | 0.07 |
| bdl | 0.01 | 0.01 | 21.16 | 0.02 | 1.58 | 0.01 | 0.01 | 0.07 |
| bdl | 0.01 | 0.01 | 18.36 | 0.02 | 1.76 | 0.01 | 0.01 | 0.07 |
| bdl | bdl | bdl | 14.18 | 0.02 | 2.46 | 0.01 | 0.01 | 0.07 |
| 0.01 | bdl | bdl | 7.23 | 0.01 | 2.17 | 0.43 | 0.42 | 0.03 |
| 2.06 | 0.01 | 0.01 | Sat | 0.08 | 1.34 | 0.45 | 0.45 | 0.05 |
| 1.12 | 0.02 | 0.02 | 28.83 | 0.05 | 1.74 | 0.61 | 0.60 | 0.04 |
| 0.57 | bdl | bdl | 27.66 | 0.02 | 2.16 | 0.74 | 0.73 | 0.04 |
| 0.44 | 0.01 | 0.01 | 17.36 | 0.02 | 2.56 | 0.57 | 0.57 | 0.05 |
| 0.34 | 0.01 | 0.01 | 21.52 | 0.03 | 2.30 | 0.78 | 0.77 | 0.04 |
| 0.81 | 0.14 | 0.14 | 16.63 | 0.02 | 2.14 | 0.78 | 0.77 | 0.05 |
| 0.64 | 0.27 | 0.27 | 14.82 | 0.02 | 2.28 | 0.78 | 0.77 | 0.05 |
| 0.54 | 0.19 | 0.19 | 13.74 | 0.02 | 2.25 | 0.76 | 0.75 | 0.05 |
| 0.38 | 0.19 | 0.20 | 9.95 | 0.01 | 2.00 | 0.72 | 0.70 | 0.05 |
| 0.07 | 0.05 | 0.07 | 8.34 | bdl | 2.96 | 0.63 | 0.61 | 0.12 |
| bdl | 0.01 | 0.01 | 29.79 | 0.71 | 6.04 | bdl | bdl | 0.11 |
| bdl | 0.01 | 0.01 | 21.63 | 0.45 | 5.32 | bdl | bdl | 0.12 |
| bdl | 0.01 | 0.01 | 22.14 | 0.43 | 6.73 | bdl | bdl | 0.11 |
| bdl | 0.00 | 0.01 | 16.27 | 0.26 | 4.07 | bdl | bdl | 0.12 |
| bdl | 0.01 | 0.01 | 10.91 | 0.16 | 1.68 | bdl | bdl | 0.10 |
| bdl | 0.00 | bdl | 9.70 | 0.07 | 0.87 | bdl | bdl | 0.09 |
| 0.01 | 0.01 | bdl | 12.93 | 0.06 | 1.01 | bdl | bdl | 0.08 |
| 0.01 | 0.01 | 0.01 | 10.58 | 0.06 | 0.53 | bdl | bdl | 0.09 |
| bdl | 0.01 | 0.01 | 11.88 | 0.11 | 0.68 | bdl | bdl | 0.10 |
| bdl | 0.02 | 0.02 | 18.13 | 0.12 | 0.99 | bdl | bdl | 0.08 |
| bdl | 0.01 | 0.01 | 15.24 | 0.13 | 0.89 | bdl | bdl | 0.11 |
| bdl | 0.01 | 0.01 | 15.87 | 0.12 | 0.85 | bdl | bdl | 0.09 |
| 0.01 | 0.01 | 0.01 | 14.14 | 0.10 | 0.75 | bdl | bdl | 0.09 |
| bdl | 0.02 | 0.02 | 14.86 | 0.09 | 0.73 | bdl | bdl | 0.08 |
| 0.01 | 0.01 | 0.01 | 13.43 | 0.09 | 0.62 | bdl | bdl | 0.08 |
| bdl | 0.02 | 0.02 | 13.80 | 0.08 | 0.59 | bdl | bdl | 0.07 |
| bdl | 0.01 | 0.01 | 17.44 | 0.06 | 0.65 | bdl | bdl | 0.07 |

| Na 330.237 | Ni 231.604 | P 213.617 | Pb 220.353 | S 180.669 | Sb 206.836 | Se 196.026 | Si 212.412 | Si 251.611 |
|---|---|---|---|---|---|---|---|---|
| 18.18 | bdl | 0.01 | 0.01 | 9.26 | bdl | 0.02 | 14.87 | 14.80 |
| 17.99 | bdl | bdl | bdl | 7.95 | 0.01 | 0.04 | 14.95 | 15.03 |
| 16.55 | bdl | bdl | 0.01 | 8.09 | 0.01 | 0.03 | 13.29 | 13.41 |
| 16.57 | bdl | bdl | bdl | 8.61 | 0.01 | 0.01 | 12.97 | 13.03 |
| 16.12 | bdl | 0.02 | bdl | 7.56 | bdl | 0.01 | 13.02 | 13.11 |
| 15.86 | bdl | bdl | 0.01 | 7.56 | bdl | bdl | 12.67 | 12.81 |
| 15.47 | bdl | 0.02 | bdl | 6.65 | 0.01 | 0.06 | 13.18 | 13.28 |
| 15.53 | bdl | 0.01 | bdl | 7.20 | bdl | 0.02 | 12.25 | 12.27 |
| 15.06 | bdl | 0.01 | bdl | 7.13 | bdl | 0.02 | 12.14 | 12.16 |
| 14.70 | bdl | 0.01 | bdl | 6.86 | bdl | bdl | 11.33 | 11.53 |
| 12.55 | bdl | 0.02 | bdl | 4.93 | bdl | 0.01 | 10.79 | 10.99 |
| 14.39 | bdl | 0.02 | bdl | 6.38 | bdl | bdl | 13.25 | 13.58 |
| 13.07 | bdl | bdl | bdl | 4.17 | bdl | bdl | 8.77 | 9.11 |
| 14.08 | bdl | 0.06 | bdl | 5.66 | bdl | 0.01 | 9.42 | 9.68 |
| 15.64 | bdl | 0.08 | bdl | 8.03 | bdl | bdl | 8.44 | 8.73 |
| 22.92 | bdl | bdl | bdl | 17.82 | bdl | 0.02 | 12.68 | 12.95 |
| 17.49 | bdl | 0.01 | bdl | 10.51 | bdl | 0.02 | 14.19 | 14.48 |
| 20.37 | bdl | bdl | bdl | 10.93 | bdl | 0.02 | 13.86 | 13.96 |
| 17.62 | bdl | bdl | bdl | 9.06 | bdl | 0.01 | 13.72 | 13.73 |
| 20.23 | bdl | bdl | 0.01 | 9.33 | bdl | 0.01 | 15.47 | 15.46 |
| 15.80 | bdl | bdl | bdl | 7.32 | 0.01 | 0.01 | 13.90 | 14.02 |
| 15.96 | bdl | bdl | bdl | 7.96 | bdl | 0.04 | 13.30 | 13.38 |
| 15.17 | bdl | bdl | bdl | 7.40 | bdl | bdl | 12.79 | 12.92 |
| 15.31 | bdl | bdl | bdl | 5.70 | bdl | bdl | 12.38 | 12.72 |
| 13.71 | bdl | 0.09 | bdl | 6.94 | bdl | bdl | 5.11 | 5.38 |
| 18.32 | 0.01 | bdl | bdl | 18.86 | bdl | bdl | 29.35 | 29.71 |
| 17.90 | 0.01 | bdl | bdl | 14.66 | bdl | 0.02 | 23.97 | 24.69 |
| 20.19 | 0.01 | bdl | bdl | 15.16 | bdl | 0.04 | 24.77 | 24.98 |
| 19.03 | 0.01 | bdl | bdl | 10.45 | bdl | 0.01 | 20.64 | 20.64 |
| 18.92 | 0.01 | bdl | bdl | 13.16 | bdl | 0.01 | 24.43 | 24.59 |
| 15.39 | 0.01 | bdl | bdl | 11.37 | bdl | bdl | 21.48 | 21.58 |
| 14.41 | bdl | bdl | bdl | 10.82 | bdl | 0.01 | 20.78 | 20.92 |
| 13.64 | bdl | bdl | bdl | 10.13 | 0.01 | bdl | 20.80 | 20.97 |
| 13.60 | bdl | bdl | bdl | 7.13 | bdl | 0.01 | 16.96 | 17.39 |
| 15.27 | bdl | bdl | bdl | 7.33 | bdl | 0.02 | 9.56 | 9.90 |
| 259.27 | bdl | bdl | 0.01 | 244.06 | bdl | 0.05 | 12.13 | 12.32 |
| 113.80 | bdl | 0.01 | 0.01 | 154.54 | bdl | 0.03 | 13.13 | 13.36 |
| 75.99 | bdl | bdl | 0.01 | 180.99 | bdl | 0.07 | 14.94 | 15.22 |
| 29.43 | bdl | bdl | 0.01 | 132.95 | bdl | 0.05 | 16.61 | 16.97 |
| 19.77 | bdl | 0.01 | 0.01 | 46.08 | bdl | 0.03 | 16.47 | 16.83 |
| 18.99 | bdl | bdl | bdl | 18.87 | bdl | 0.03 | 16.13 | 16.25 |
| 19.57 | bdl | bdl | 0.01 | 13.07 | bdl | 0.05 | 15.43 | 15.55 |
| 19.12 | bdl | bdl | 0.01 | 11.13 | bdl | 0.03 | 14.68 | 14.76 |
| 18.64 | bdl | 0.02 | bdl | 9.06 | bdl | bdl | 16.51 | 16.63 |
| 18.61 | bdl | bdl | bdl | 10.46 | bdl | 0.01 | 16.41 | 16.46 |
| 20.52 | bdl | bdl | bdl | 11.10 | bdl | bdl | 16.67 | 16.75 |
| 17.94 | bdl | bdl | bdl | 10.30 | bdl | bdl | 15.95 | 15.97 |
| 17.47 | bdl | bdl | bdl | 8.94 | bdl | bdl | 15.40 | 15.46 |
| 17.35 | bdl | bdl | bdl | 8.36 | bdl | bdl | 14.83 | 14.89 |
| 16.74 | bdl | bdl | bdl | 8.50 | bdl | 0.01 | 14.61 | 14.71 |
| 16.35 | 0.01 | 0.02 | bdl | 7.63 | bdl | 0.01 | 14.19 | 14.33 |
| 16.08 | bdl | bdl | bdl | 7.78 | 0.01 | bdl | 13.30 | 13.30 |

| Sr 421.552 | Sr 460.733 | Ti 334.940 | Tl 190.801 | V 290.880 | Zn 206.200 | Zn 213.857 |
|---|---|---|---|---|---|---|
| 0.12 | 0.12 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.10 | 0.10 | bdl | bdl | 0.01 | 0.04 | 0.04 |
| 0.10 | 0.10 | bdl | bdl | 0.01 | 0.02 | 0.02 |
| 0.10 | 0.09 | bdl | 0.01 | 0.01 | 0.02 | 0.02 |
| 0.09 | 0.09 | bdl | 0.01 | 0.01 | 0.05 | 0.05 |
| 0.11 | 0.10 | bdl | 0.01 | 0.01 | 0.10 | 0.09 |
| 0.09 | 0.08 | bdl | bdl | 0.01 | 0.01 | 0.01 |
| 0.10 | 0.10 | bdl | 0.01 | bdl | 0.02 | 0.02 |
| 0.10 | 0.10 | bdl | 0.01 | bdl | 0.01 | bdl |
| 0.11 | 0.11 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.09 | 0.09 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.11 | 0.11 | bdl | bdl | 0.04 | 0.01 | 0.01 |
| 0.07 | 0.08 | bdl | 0.01 | 0.09 | bdl | bdl |
| 0.10 | 0.10 | bdl | 0.01 | 0.03 | bdl | 0.01 |
| 0.15 | 0.14 | bdl | 0.01 | 0.03 | bdl | 0.01 |
| 0.25 | 0.27 | bdl | 0.01 | bdl | 0.03 | 0.03 |
| 0.17 | 0.18 | bdl | 0.02 | bdl | 0.01 | 0.01 |
| 0.10 | 0.20 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.15 | 0.15 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.17 | 0.18 | bdl | bdl | bdl | 0.03 | 0.03 |
| 0.16 | 0.15 | bdl | 0.01 | 0.01 | 0.04 | 0.04 |
| 0.16 | 0.15 | bdl | bdl | 0.01 | 0.03 | 0.03 |
| 0.17 | 0.16 | bdl | 0.01 | bdl | 0.05 | 0.04 |
| 0.18 | 0.18 | bdl | 0.01 | 0.04 | 0.02 | 0.02 |
| 0.06 | 0.06 | bdl | bdl | 0.02 | 0.01 | 0.02 |
| 0.08 | 0.09 | bdl | bdl | bdl | 0.44 | 0.45 |
| 0.09 | 0.09 | bdl | bdl | bdl | 0.43 | 0.44 |
| 0.05 | 0.11 | bdl | bdl | bdl | 0.39 | 0.42 |
| 0.10 | 0.10 | bdl | bdl | bdl | 0.35 | 0.35 |
| 0.09 | 0.09 | bdl | bdl | bdl | 0.40 | 0.40 |
| 0.09 | 0.08 | bdl | 0.01 | bdl | 0.15 | 0.15 |
| 0.09 | 0.08 | bdl | bdl | bdl | 0.15 | 0.16 |
| 0.08 | 0.08 | bdl | bdl | bdl | 0.11 | 0.11 |
| 0.08 | 0.07 | bdl | bdl | 0.02 | 0.06 | 0.07 |
| 0.10 | 0.09 | bdl | 0.01 | 0.02 | 0.01 | 0.01 |
| 0.72 | 0.90 | bdl | bdl | bdl | 0.12 | 0.13 |
| 0.55 | 0.65 | bdl | 0.01 | bdl | 0.09 | 0.10 |
| 0.67 | 0.78 | bdl | bdl | 0.01 | 0.00 | 0.01 |
| 0.50 | 0.57 | bdl | bdl | 0.01 | 0.05 | 0.06 |
| 0.24 | 0.25 | bdl | bdl | 0.02 | 0.05 | 0.05 |
| 0.07 | 0.15 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.07 | 0.15 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.05 | 0.10 | bdl | bdl | bdl | 0.03 | 0.03 |
| 0.11 | 0.11 | bdl | bdl | 0.01 | 0.02 | 0.02 |
| 0.14 | 0.14 | bdl | 0.01 | 0.01 | 0.03 | 0.03 |
| 0.13 | 0.13 | bdl | bdl | 0.01 | 0.04 | 0.04 |
| 0.12 | 0.13 | bdl | bdl | bdl | 0.03 | 0.03 |
| 0.11 | 0.11 | bdl | bdl | 0.01 | 0.04 | 0.04 |
| 0.11 | 0.11 | bdl | bdl | 0.01 | 0.02 | 0.02 |
| 0.10 | 0.10 | bdl | 0.02 | 0.01 | 0.03 | 0.03 |
| 0.10 | 0.09 | bdl | bdl | 0.01 | 0.04 | 0.04 |
| 0.10 | 0.09 | bdl | 0.01 | 0.01 | 0.03 | 0.03 |

| Sample ID | Sample Number | Ag 328.068 | Al 308.215 | Al 396.153 | As 188.979 | Au 267.595 | B 249.677 |
|---|---|---|---|---|---|---|---|
| Arrieros/LB B Effluent | 18 | bdl | 0.01 | 0.02 | 0.02 | bdl | 0.15 |
| Arrieros/LB B Effluent | 19 | bdl | bdl | bdl | 0.01 | bdl | 0.14 |
| Arrieros/LB B Effluent | 20 | bdl | 0.01 | bdl | 0.01 | bdl | 0.13 |
| Arrieros/LB B Effluent | 21 | bdl | 0.02 | bdl | 0.01 | bdl | 0.11 |
| Arrieros/LB B Effluent | 22 | bdl | 0.01 | bdl | bdl | bdl | 0.10 |
| Arrieros/LB B Effluent | 23 | bdl | bdl | bdl | bdl | bdl | 0.13 |
| Arrieros/LB B Effluent | 24 | 0.01 | bdl | bdl | 0.01 | bdl | 0.09 |
| Arrieros/LB B Effluent | 25 | bdl | bdl | bdl | bdl | bdl | 0.07 |
| Arrieros/LB B Effluent | 26 | bdl | bdl | bdl | bdl | bdl | 0.06 |
| Arrieros/LB B Gravel | 3 | bdl | bdl | bdl | bdl | bdl | 0.76 |
| Arrieros/LB B Gravel | 5 | bdl | 0.26 | 0.24 | 0.01 | bdl | 0.58 |
| Arrieros/LB B Gravel | 7 | bdl | bdl | bdl | 0.01 | bdl | 0.41 |
| Arrieros/LB B Gravel | 9 | bdl | bdl | bdl | 0.01 | bdl | 0.40 |
| Arrieros/LB B Gravel | 11 | bdl | 0.06 | bdl | 0.02 | bdl | 0.48 |
| Arrieros/LB B Gravel | 13 | bdl | 0.12 | 0.17 | 0.01 | bdl | 0.29 |
| Arrieros/LB B Gravel | 15 | 0.01 | bdl | 0.03 | 0.02 | bdl | 0.27 |
| Arrieros/LB B Gravel | 17 | 0.01 | 0.02 | 0.05 | 0.02 | bdl | 0.22 |
| Arrieros/LB B Gravel | 23 | bdl | bdl | bdl | bdl | bdl | 0.27 |
| Arrieros/LB B Gravel | 26 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Arrieros/LB B Ore | 3 | bdl | 0.01 | bdl | bdl | bdl | 0.61 |
| Arrieros/LB B Ore | 5 | bdl | 0.06 | 0.05 | 0.01 | bdl | 0.39 |
| Arrieros/LB B Ore | 7 | bdl | bdl | bdl | bdl | bdl | 0.53 |
| Arrieros/LB B Ore | 9 | bdl | 0.03 | 0.01 | bdl | bdl | 0.19 |
| Arrieros/LB B Ore | 11 | bdl | 0.08 | bdl | 0.01 | bdl | 0.26 |
| Arrieros/LB B Ore | 13 | 0.01 | 0.03 | 0.06 | 0.01 | bdl | 0.03 |
| Arrieros/LB B Ore | 15 | bdl | 0.02 | 0.04 | 0.01 | bdl | 0.05 |
| Arrieros/LB B Ore | 17 | bdl | 0.01 | 0.01 | bdl | bdl | 0.02 |
| Arrieros/LB B Ore | 23 | bdl | bdl | bdl | 0.01 | bdl | 0.02 |
| Arrieros/LB B Ore | 26 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Carbonate | 1 | bdl | bdl | bdl | bdl | bdl | 0.15 |
| Talbot/T7 A Carbonate | 2 | bdl | bdl | bdl | bdl | bdl | 0.14 |
| Talbot/T7 A Carbonate | 3 | bdl | bdl | 0.01 | bdl | bdl | 0.08 |
| Talbot/T7 A Carbonate | 4 | bdl | 0.03 | 0.05 | bdl | bdl | 0.04 |
| Talbot/T7 A Carbonate | 5 | bdl | bdl | 0.01 | bdl | bdl | 0.05 |
| Talbot/T7 A Carbonate | 6 | bdl | bdl | 0.01 | bdl | bdl | 0.17 |
| Talbot/T7 A Carbonate | 7 | bdl | bdl | 0.01 | bdl | bdl | 0.03 |
| Talbot/T7 A Carbonate | 8 | bdl | bdl | 0.02 | bdl | bdl | 0.11 |
| Talbot/T7 A Carbonate | 9 | bdl | bdl | 0.02 | bdl | bdl | 0.09 |
| Talbot/T7 A Carbonate | 11 | bdl | bdl | 0.02 | 0.01 | bdl | 0.24 |
| Talbot/T7 A Carbonate | 12 | bdl | bdl | 0.01 | bdl | bdl | 0.04 |
| Talbot/T7 A Carbonate | 15 | bdl | bdl | bdl | bdl | bdl | 0.12 |
| Talbot/T7 A Carbonate | 17 | bdl | bdl | bdl | bdl | bdl | 0.18 |
| Talbot/T7 A Carbonate | 19 | bdl | bdl | bdl | bdl | bdl | 0.20 |
| Talbot/T7 A Carbonate | 21 | bdl | 0.04 | bdl | bdl | bdl | 0.20 |
| Talbot/T7 A Carbonate | 23 | bdl | 0.07 | bdl | bdl | bdl | 0.17 |
| Talbot/T7 A Carbonate | 25 | 0.01 | 0.03 | 0.05 | 0.02 | bdl | 0.05 |
| Talbot/T7 A Carbonate | 27 | 0.01 | 0.07 | 0.08 | bdl | bdl | 0.03 |
| Talbot/T7 A Carbonate | 29 | 0.01 | 0.03 | 0.04 | 0.02 | bdl | 0.03 |
| Talbot/T7 A Carbonate | 35 | bdl | 0.07 | 0.04 | bdl | bdl | 0.02 |
| Talbot/T7 A Carbonate | 38 | bdl | 0.03 | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Effluent | 1 | bdl | bdl | bdl | bdl | bdl | 0.18 |
| Talbot/T7 A Effluent | 2 | bdl | bdl | bdl | bdl | bdl | 0.07 |

| Ba 455.403 | Be 313.042 | Ca 317.933 | Cd 226.502 | Cd 228.802 | Co 228.616 | Cr 267.716 | Cr 283.563 | Cu 324.752 |
|---|---|---|---|---|---|---|---|---|
| 0.01 | bdl | 19.80 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 19.74 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 18.58 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 19.27 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 14.82 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.03 | 0.01 | 17.85 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.00 | 0.01 | 12.81 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 17.23 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 23.17 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.56 | bdl | 20.26 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.48 | bdl | 14.60 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.54 | bdl | 15.26 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.55 | bdl | 13.04 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.68 | bdl | 16.30 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 16.24 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 15.39 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 16.50 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 17.17 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| 0.02 | 0.01 | 23.40 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.84 | bdl | 3.67 | bdl | bdl | bdl | bdl | bdl | 0.56 |
| 0.53 | bdl | 3.95 | bdl | bdl | bdl | bdl | bdl | 0.59 |
| 1.04 | bdl | 5.38 | bdl | bdl | 0.01 | bdl | bdl | 0.15 |
| 0.55 | bdl | 6.22 | bdl | bdl | 0.01 | bdl | bdl | 0.27 |
| 0.57 | bdl | 4.66 | bdl | bdl | bdl | bdl | 0.01 | 0.10 |
| 0.08 | bdl | 5.61 | bdl | bdl | bdl | bdl | bdl | 0.49 |
| 0.07 | bdl | 3.99 | bdl | bdl | bdl | bdl | bdl | 0.78 |
| 0.07 | bdl | 4.32 | bdl | bdl | bdl | bdl | bdl | 0.52 |
| 0.09 | bdl | 4.30 | bdl | bdl | bdl | bdl | bdl | 0.16 |
| 0.08 | 0.01 | 3.84 | bdl | bdl | 0.01 | bdl | bdl | 0.14 |
| 0.12 | bdl | 635.86 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.61 | bdl | 390.20 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.07 | bdl | 169.91 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.04 | bdl | 103.88 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.06 | bdl | 78.16 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.49 | bdl | 62.79 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.05 | bdl | 42.31 | bdl | bdl | bdl | bdl | bdl | 0.03 |
| 0.49 | bdl | 38.62 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.34 | bdl | 34.70 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.55 | bdl | 25.69 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.05 | bdl | 22.17 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.48 | bdl | 22.99 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.56 | bdl | 23.39 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.48 | bdl | 19.60 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.52 | bdl | 17.16 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 21.37 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 17.07 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | bdl | 17.84 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | bdl | 17.19 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | 0.01 | 15.46 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| 0.01 | 0.01 | 14.41 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.14 | bdl | 569.32 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.14 | bdl | 319.98 | bdl | bdl | bdl | bdl | bdl | bdl |

| Cu 327.393 | Fe 238.204 | Fe 239.562 | K 766.490 | Li 670.784 | Mg 285.213 | Mn 257.610 | Mn 259.372 | Mo 202.031 |
|---|---|---|---|---|---|---|---|---|
| 0.01 | 0.05 | 0.05 | 16.77 | 0.06 | 0.72 | 0.01 | 0.01 | 0.07 |
| 0.01 | 0.02 | 0.02 | 20.19 | 0.07 | 0.84 | 0.01 | 0.01 | 0.07 |
| bdl | bdl | bdl | 19.18 | 0.06 | 0.77 | 0.01 | 0.01 | 0.06 |
| 0.01 | 0.01 | 0.01 | 18.61 | 0.06 | 0.93 | 0.01 | 0.01 | 0.06 |
| bdl | bdl | bdl | 15.02 | 0.04 | 0.94 | 0.02 | 0.02 | 0.06 |
| bdl | bdl | bdl | 17.47 | 0.06 | 1.02 | 0.01 | 0.01 | 0.08 |
| bdl | bdl | bdl | 12.70 | 0.04 | 0.89 | 0.02 | 0.02 | 0.05 |
| bdl | bdl | bdl | 10.96 | 0.03 | 1.57 | 0.07 | 0.07 | 0.05 |
| bdl | bdl | bdl | 12.09 | 0.04 | 1.84 | 0.05 | 0.04 | 0.02 |
| bdl | 0.01 | bdl | 37.55 | 0.11 | 2.07 | bdl | bdl | 0.08 |
| bdl | 0.01 | 0.01 | 39.83 | 0.08 | 1.45 | 0.01 | 0.01 | 0.08 |
| bdl | bdl | bdl | Sat | 0.03 | 1.38 | 0.01 | 0.01 | 0.07 |
| bdl | 0.01 | 0.01 | 32.33 | 0.04 | 1.18 | bdl | bdl | 0.07 |
| bdl | bdl | bdl | 28.58 | 0.04 | 1.50 | bdl | 0.01 | 0.09 |
| 0.01 | 0.07 | 0.07 | 21.35 | 0.03 | 1.57 | 0.01 | 0.01 | 0.07 |
| bdl | 0.02 | 0.02 | 17.77 | 0.02 | 1.45 | 0.01 | 0.01 | 0.08 |
| bdl | 0.01 | 0.01 | 16.04 | 0.02 | 1.60 | 0.01 | 0.01 | 0.07 |
| 0.01 | bdl | bdl | 13.11 | 0.02 | 1.67 | 0.01 | 0.01 | 0.05 |
| bdl | bdl | bdl | 9.02 | 0.01 | 2.03 | 0.04 | 0.04 | 0.02 |
| 0.56 | 0.02 | 0.01 | 25.28 | 0.05 | 1.10 | 0.27 | 0.27 | 0.07 |
| 0.59 | 0.02 | 0.02 | 18.32 | 0.03 | 1.63 | 0.44 | 0.43 | 0.07 |
| 0.17 | 0.00 | bdl | 18.63 | 0.02 | 2.20 | 0.61 | 0.60 | 0.06 |
| 0.27 | 0.01 | 0.01 | 10.90 | 0.02 | 3.46 | 0.54 | 0.54 | 0.11 |
| 0.10 | 0.01 | 0.01 | 12.21 | 0.02 | 2.49 | 0.43 | 0.42 | 0.07 |
| 0.47 | 0.02 | 0.02 | 8.44 | 0.01 | 2.30 | 0.17 | 0.17 | 0.05 |
| 0.76 | 0.02 | 0.02 | 9.90 | 0.03 | 2.06 | 0.41 | 0.40 | 0.05 |
| 0.51 | 0.03 | 0.03 | 7.68 | 0.01 | 1.79 | 0.28 | 0.27 | 0.04 |
| 0.16 | bdl | bdl | 7.43 | bdl | 2.14 | 0.21 | 0.20 | 0.05 |
| 0.14 | bdl | bdl | 6.94 | bdl | 1.76 | 0.28 | 0.27 | 0.03 |
| bdl | 0.04 | 0.04 | 24.24 | 0.02 | 36.06 | 0.14 | 0.14 | 0.01 |
| bdl | bdl | bdl | 15.72 | 0.01 | 33.73 | 0.08 | 0.07 | 0.01 |
| 0.01 | 0.01 | 0.01 | 12.96 | 0.04 | 29.35 | 0.04 | 0.04 | 0.01 |
| bdl | 0.01 | 0.01 | 12.43 | 0.03 | 25.25 | 0.02 | 0.02 | 0.01 |
| bdl | bdl | bdl | 12.66 | 0.03 | 21.50 | 0.01 | 0.01 | 0.01 |
| bdl | 0.01 | 0.01 | 10.80 | 0.02 | 21.58 | 0.01 | 0.01 | bdl |
| 0.03 | 0.01 | 0.01 | 9.89 | 0.02 | 15.36 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 8.98 | 0.02 | 14.16 | bdl | bdl | bdl |
| bdl | 0.01 | 0.01 | 9.16 | 0.01 | 13.31 | bdl | bdl | 0.01 |
| bdl | 0.01 | 0.02 | 9.24 | 0.01 | 11.48 | bdl | bdl | 0.01 |
| bdl | bdl | bdl | 9.65 | 0.01 | 8.77 | bdl | bdl | bdl |
| bdl | 0.01 | 0.01 | 8.74 | 0.01 | 9.99 | bdl | bdl | bdl |
| bdl | bdl | bdl | 9.76 | 0.01 | 11.41 | bdl | bdl | bdl |
| bdl | bdl | bdl | 10.35 | bdl | 8.86 | bdl | bdl | 0.01 |
| bdl | 0.01 | 0.01 | 8.28 | 0.01 | 8.64 | bdl | bdl | bdl |
| bdl | 0.01 | 0.01 | 12.55 | 0.01 | 10.37 | bdl | bdl | bdl |
| 0.01 | 0.01 | bdl | 8.16 | bdl | 8.55 | bdl | bdl | bdl |
| 0.01 | 0.01 | 0.01 | 9.20 | bdl | 8.85 | bdl | bdl | bdl |
| 0.01 | 0.01 | 0.01 | 8.38 | bdl | 8.57 | bdl | bdl | bdl |
| 0.01 | bdl | bdl | 13.30 | bdl | 8.05 | bdl | bdl | bdl |
| 0.01 | bdl | bdl | 9.90 | bdl | 6.61 | bdl | bdl | bdl |
| bdl | 0.02 | 0.02 | 35.45 | 0.02 | 103.46 | 1.54 | 1.52 | 0.01 |
| bdl | 0.01 | 0.00 | 19.07 | 0.01 | 49.15 | 1.60 | 1.58 | 0.01 |

| Na 330.237 | Ni 231.604 | P 213.617 | Pb 220.353 | S 180.669 | Sb 206.836 | Se 196.026 | Si 212.412 | Si 251.611 |
|---|---|---|---|---|---|---|---|---|
| 15.99 | bdl | bdl | bdl | 7.93 | bdl | bdl | 13.28 | 13.38 |
| 15.41 | bdl | bdl | bdl | 7.35 | bdl | 0.01 | 12.74 | 12.76 |
| 14.95 | bdl | bdl | bdl | 7.13 | bdl | bdl | 12.42 | 12.44 |
| 14.86 | bdl | bdl | 0.01 | 6.87 | bdl | 0.01 | 11.72 | 11.87 |
| 12.62 | bdl | bdl | bdl | 4.94 | 0.00 | 0.01 | 11.13 | 11.29 |
| 14.80 | bdl | 0.02 | bdl | 6.39 | bdl | 0.02 | 13.99 | 14.44 |
| 13.71 | bdl | 0.03 | bdl | 4.68 | bdl | bdl | 9.84 | 10.06 |
| 14.75 | bdl | 0.07 | bdl | 5.83 | bdl | 0.00 | 8.79 | 9.05 |
| 15.88 | bdl | 0.08 | bdl | 8.24 | bdl | 0.00 | 8.00 | 8.28 |
| 21.75 | bdl | bdl | bdl | 16.42 | bdl | 0.01 | 13.37 | 13.59 |
| 19.45 | bdl | bdl | bdl | 10.49 | bdl | bdl | 15.82 | 16.11 |
| 18.92 | bdl | bdl | 0.01 | 9.64 | bdl | 0.02 | 14.69 | 14.80 |
| 16.01 | bdl | bdl | bdl | 8.69 | bdl | 0.00 | 14.14 | 14.41 |
| 20.31 | bdl | bdl | bdl | 9.57 | bdl | 0.01 | 16.29 | 16.34 |
| 16.11 | 0.01 | bdl | bdl | 7.83 | 0.01 | 0.01 | 14.74 | 14.84 |
| 16.06 | bdl | 0.00 | bdl | 7.31 | bdl | bdl | 13.64 | 13.74 |
| 15.29 | bdl | 0.01 | bdl | 7.33 | 0.01 | 0.01 | 12.66 | 12.74 |
| 15.48 | bdl | bdl | bdl | 5.41 | bdl | 0.01 | 11.15 | 11.39 |
| 14.95 | bdl | 0.08 | bdl | 7.40 | bdl | bdl | 5.29 | 5.57 |
| 18.68 | bdl | bdl | bdl | 13.52 | bdl | 0.01 | 25.94 | 26.28 |
| 16.89 | bdl | bdl | bdl | 10.50 | 0.01 | 0.02 | 23.07 | 23.80 |
| 23.46 | 0.01 | bdl | 0.01 | 11.76 | bdl | 0.01 | 25.33 | 25.63 |
| 21.53 | bdl | bdl | bdl | 9.85 | bdl | 0.01 | 11.19 | 11.36 |
| 17.79 | 0.01 | bdl | bdl | 8.83 | bdl | bdl | 16.82 | 16.87 |
| 14.66 | bdl | bdl | bdl | 6.44 | bdl | 0.02 | 6.80 | 7.03 |
| 13.41 | bdl | bdl | bdl | 7.05 | bdl | 0.01 | 13.74 | 13.83 |
| 12.59 | bdl | bdl | bdl | 5.73 | 0.01 | bdl | 7.94 | 8.15 |
| 14.85 | bdl | bdl | bdl | 4.84 | bdl | bdl | 6.11 | 6.35 |
| 10.54 | bdl | bdl | bdl | 6.57 | bdl | bdl | 3.09 | 3.23 |
| 17.79 | bdl | bdl | 0.01 | 503.52 | bdl | 0.11 | 7.23 | 7.32 |
| 17.46 | bdl | bdl | 0.01 | 283.79 | bdl | 0.06 | 6.33 | 6.36 |
| 15.80 | bdl | bdl | bdl | 133.15 | bdl | 0.06 | 4.56 | 4.60 |
| 16.57 | bdl | bdl | bdl | 81.39 | bdl | 0.04 | 3.91 | 3.99 |
| 15.94 | bdl | bdl | 0.01 | 56.34 | bdl | 0.05 | 3.64 | 3.73 |
| 17.78 | bdl | 0.01 | 0.01 | 40.85 | bdl | 0.02 | 4.45 | 4.48 |
| 15.30 | bdl | bdl | bdl | 23.67 | bdl | 0.00 | 2.90 | 2.94 |
| 17.60 | bdl | bdl | 0.01 | 17.40 | 0.01 | 0.01 | 3.24 | 3.31 |
| 17.22 | bdl | 0.01 | bdl | 15.92 | bdl | 0.00 | 2.95 | 3.00 |
| 17.90 | bdl | bdl | 0.01 | 10.61 | bdl | 0.01 | 3.83 | 3.87 |
| 14.99 | bdl | bdl | bdl | 10.14 | bdl | 0.01 | 2.06 | 2.10 |
| 17.09 | bdl | bdl | bdl | 9.39 | bdl | bdl | 2.10 | 2.13 |
| 18.85 | bdl | bdl | bdl | 11.96 | 0.01 | 0.04 | 2.77 | 2.82 |
| 20.82 | bdl | bdl | bdl | 10.76 | bdl | 0.01 | 2.79 | 2.83 |
| 18.47 | bdl | bdl | bdl | 6.95 | bdl | 0.01 | 2.71 | 2.74 |
| 23.19 | bdl | bdl | bdl | 10.91 | bdl | 0.01 | 2.45 | 2.53 |
| 14.79 | bdl | bdl | bdl | 7.65 | 0.01 | bdl | 2.06 | 2.07 |
| 17.44 | bdl | bdl | bdl | 7.00 | 0.01 | bdl | 1.92 | 1.94 |
| 15.54 | bdl | bdl | bdl | 7.71 | bdl | 0.03 | 1.91 | 1.93 |
| 21.58 | bdl | bdl | bdl | 8.82 | bdl | bdl | 1.58 | 1.64 |
| 14.14 | bdl | 0.04 | bdl | 8.21 | bdl | bdl | 1.05 | 1.07 |
| 22.78 | bdl | bdl | 0.01 | 527.62 | bdl | 0.12 | 7.36 | 7.42 |
| 18.86 | bdl | bdl | 0.02 | 261.77 | bdl | 0.05 | 6.63 | 6.73 |

| Sr 421.552 | Sr 460.733 | Ti 334.940 | Tl 190.801 | V 290.880 | Zn 206.200 | Zn 213.857 |
|---|---|---|---|---|---|---|
| 0.09 | 0.09 | bdl | bdl | 0.01 | 0.08 | 0.08 |
| 0.11 | 0.11 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.10 | 0.10 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.11 | 0.11 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.10 | 0.10 | bdl | 0.01 | bdl | 0.01 | 0.01 |
| 0.11 | 0.11 | bdl | 0.01 | 0.04 | 0.01 | 0.01 |
| 0.09 | 0.09 | bdl | 0.01 | 0.04 | 0.01 | 0.01 |
| 0.14 | 0.13 | bdl | 0.02 | 0.03 | 0.01 | 0.01 |
| 0.16 | 0.15 | bdl | 0.01 | 0.02 | 0.01 | 0.01 |
| 0.20 | 0.21 | bdl | 0.01 | bdl | 0.02 | 0.02 |
| 0.15 | 0.15 | bdl | bdl | 0.01 | 0.01 | 0.01 |
| 0.08 | 0.16 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.13 | 0.13 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.16 | 0.17 | bdl | bdl | bdl | 0.04 | 0.04 |
| 0.16 | 0.15 | bdl | bdl | 0.01 | 0.16 | 0.16 |
| 0.15 | 0.14 | bdl | bdl | 0.01 | 0.03 | 0.02 |
| 0.16 | 0.15 | bdl | 0.02 | bdl | 0.02 | 0.02 |
| 0.17 | 0.17 | bdl | bdl | 0.04 | 0.01 | 0.01 |
| 0.19 | 0.18 | bdl | 0.01 | 0.02 | 0.07 | 0.07 |
| 0.07 | 0.07 | bdl | 0.01 | bdl | 0.36 | 0.36 |
| 0.09 | 0.09 | bdl | bdl | bdl | 0.34 | 0.34 |
| 0.06 | 0.12 | bdl | bdl | bdl | 0.24 | 0.25 |
| 0.15 | 0.15 | bdl | bdl | bdl | 0.25 | 0.25 |
| 0.09 | 0.09 | bdl | 0.01 | bdl | 0.22 | 0.21 |
| 0.05 | 0.05 | bdl | bdl | bdl | 0.11 | 0.11 |
| 0.07 | 0.07 | bdl | bdl | bdl | 0.10 | 0.10 |
| 0.05 | 0.05 | bdl | bdl | bdl | 0.10 | 0.11 |
| 0.05 | 0.05 | bdl | 0.01 | 0.02 | 0.02 | 0.02 |
| 0.01 | 0.01 | bdl | 0.01 | 0.02 | 0.02 | 0.02 |
| 0.69 | 0.75 | bdl | bdl | 0.01 | 0.28 | 0.30 |
| 0.41 | 0.43 | bdl | bdl | 0.00 | 0.25 | 0.27 |
| 0.21 | 0.24 | bdl | 0.01 | 0.01 | 0.08 | 0.09 |
| 0.15 | 0.16 | bdl | bdl | 0.01 | 0.05 | 0.05 |
| 0.13 | 0.13 | bdl | 0.01 | 0.01 | 0.04 | 0.04 |
| 0.11 | 0.11 | bdl | 0.01 | 0.01 | 0.08 | 0.08 |
| 0.07 | 0.08 | bdl | bdl | 0.01 | 0.06 | 0.06 |
| 0.07 | 0.07 | bdl | bdl | 0.01 | 0.04 | 0.04 |
| 0.06 | 0.06 | bdl | 0.02 | 0.01 | 0.04 | 0.04 |
| 0.05 | 0.06 | bdl | 0.01 | bdl | 0.01 | 0.01 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.00 | 0.01 |
| 0.04 | 0.04 | bdl | 0.02 | bdl | 0.01 | 0.02 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.04 | 0.04 |
| 0.02 | 0.04 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.04 | 0.04 | bdl | 0.01 | bdl | 0.02 | 0.02 |
| 0.04 | 0.04 | bdl | 0.01 | bdl | 0.03 | 0.03 |
| 0.03 | 0.03 | bdl | bdl | 0.01 | 0.04 | 0.03 |
| 0.03 | 0.03 | bdl | 0.01 | 0.01 | 0.05 | 0.05 |
| 0.02 | 0.03 | bdl | bdl | bdl | 0.05 | 0.05 |
| 0.02 | 0.02 | bdl | 0.01 | 0.03 | 0.12 | 0.13 |
| 0.01 | 0.01 | bdl | 0.01 | 0.02 | 0.09 | 0.09 |
| 0.78 | 0.84 | bdl | bdl | 0.01 | 0.15 | 0.16 |
| 0.40 | 0.41 | bdl | bdl | 0.01 | 0.03 | 0.03 |

| Sample ID | Sample Number | Ag 328.068 | Al 308.215 | Al 396.153 | As 188.979 | Au 267.595 | B 249.677 |
|---|---|---|---|---|---|---|---|
| Talbot/T7 A Effluent | 3 | bdl | bdl | 0.01 | bdl | bdl | 0.07 |
| Talbot/T7 A Effluent | 4 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 A Effluent | 5 | bdl | 0.03 | 0.04 | 0.01 | bdl | 0.09 |
| Talbot/T7 A Effluent | 6 | bdl | bdl | 0.01 | bdl | bdl | 0.12 |
| Talbot/T7 A Effluent | 7 | bdl | bdl | 0.02 | 0.01 | bdl | 0.05 |
| Talbot/T7 A Effluent | 8 | bdl | bdl | 0.01 | 0.01 | bdl | 0.06 |
| Talbot/T7 A Effluent | 9 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 A Effluent | 10 | bdl | bdl | 0.01 | bdl | bdl | 0.06 |
| Talbot/T7 A Effluent | 11 | bdl | bdl | bdl | 0.01 | bdl | 0.07 |
| Talbot/T7 A Effluent | 12 | bdl | bdl | bdl | 0.01 | bdl | 0.02 |
| Talbot/T7 A Effluent | 13 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 A Effluent | 14 | bdl | bdl | 0.01 | 0.01 | bdl | 0.14 |
| Talbot/T7 A Effluent | 15 | bdl | bdl | bdl | bdl | bdl | 0.11 |
| Talbot/T7 A Effluent | 16 | bdl | bdl | bdl | 0.01 | bdl | 0.04 |
| Talbot/T7 A Effluent | 17 | bdl | bdl | bdl | bdl | bdl | 0.10 |
| Talbot/T7 A Effluent | 18 | bdl | bdl | bdl | 0.01 | bdl | 0.10 |
| Talbot/T7 A Effluent | 19 | bdl | bdl | bdl | bdl | bdl | 0.08 |
| Talbot/T7 A Effluent | 20 | bdl | bdl | bdl | 0.01 | bdl | 0.10 |
| Talbot/T7 A Effluent | 21 | bdl | 0.02 | bdl | bdl | bdl | 0.10 |
| Talbot/T7 A Effluent | 22 | bdl | 0.03 | 0.01 | bdl | bdl | 0.03 |
| Talbot/T7 A Effluent | 23 | bdl | 0.05 | bdl | 0.01 | bdl | 0.09 |
| Talbot/T7 A Effluent | 24 | bdl | 0.06 | bdl | bdl | bdl | 0.03 |
| Talbot/T7 A Effluent | 25 | bdl | bdl | 0.01 | 0.01 | bdl | 0.03 |
| Talbot/T7 A Effluent | 26 | 0.01 | bdl | 0.02 | 0.02 | bdl | 0.01 |
| Talbot/T7 A Effluent | 27 | bdl | bdl | 0.01 | 0.02 | bdl | 0.01 |
| Talbot/T7 A Effluent | 28 | 0.01 | bdl | 0.02 | 0.03 | bdl | 0.01 |
| Talbot/T7 A Effluent | 29 | 0.01 | bdl | 0.03 | bdl | bdl | 0.01 |
| Talbot/T7 A Effluent | 30 | 0.01 | 0.01 | 0.01 | bdl | bdl | 0.01 |
| Talbot/T7 A Effluent | 31 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Effluent | 32 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Effluent | 33 | bdl | 0.04 | 0.01 | 0.01 | bdl | 0.01 |
| Talbot/T7 A Effluent | 34 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Effluent | 35 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Effluent | 36 | bdl | bdl | bdl | 0.01 | bdl | 0.01 |
| Talbot/T7 A Effluent | 37 | 0.01 | 0.01 | bdl | 0.01 | bdl | 0.02 |
| Talbot/T7 A Effluent | 38 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| Talbot/T7 A Ore | 1 | bdl | 0.01 | 0.02 | bdl | bdl | 0.10 |
| Talbot/T7 A Ore | 2 | bdl | bdl | bdl | bdl | bdl | 0.08 |
| Talbot/T7 A Ore | 3 | bdl | bdl | 0.02 | bdl | bdl | 0.06 |
| Talbot/T7 A Ore | 4 | bdl | bdl | 0.01 | bdl | bdl | 0.02 |
| Talbot/T7 A Ore | 5 | bdl | bdl | 0.01 | bdl | bdl | 0.04 |
| Talbot/T7 A Ore | 6 | bdl | bdl | 0.01 | bdl | bdl | 0.11 |
| Talbot/T7 A Ore | 7 | bdl | bdl | 0.02 | bdl | bdl | 0.03 |
| Talbot/T7 A Ore | 8 | bdl | bdl | 0.02 | bdl | bdl | 0.07 |
| Talbot/T7 A Ore | 9 | bdl | bdl | 0.02 | bdl | bdl | 0.09 |
| Talbot/T7 A Ore | 10 | bdl | bdl | 0.02 | bdl | bdl | 0.03 |
| Talbot/T7 A Ore | 11 | bdl | bdl | bdl | 0.01 | bdl | 0.01 |
| Talbot/T7 A Ore | 12 | bdl | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 A Ore | 15 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 A Ore | 17 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 A Ore | 19 | bdl | bdl | bdl | 0.01 | bdl | 0.14 |
| Talbot/T7 A Ore | 21 | bdl | 0.03 | bdl | bdl | bdl | 0.15 |

| Ba 455.403 | Be 313.042 | Ca 317.933 | Cd 226.502 | Cd 228.802 | Co 228.616 | Cr 267.716 | Cr 283.563 | Cu 324.752 |
|---|---|---|---|---|---|---|---|---|
| 0.08 | bdl | 119.76 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.07 | bdl | 74.96 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.08 | bdl | 59.08 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.43 | bdl | 51.99 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.06 | bdl | 38.40 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.42 | bdl | 34.12 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.42 | bdl | 33.76 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.45 | bdl | 28.77 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.40 | bdl | 25.26 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.05 | bdl | 24.77 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.48 | bdl | 28.75 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.59 | bdl | 25.31 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.64 | bdl | 27.00 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.04 | bdl | 28.56 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.61 | bdl | 30.29 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.64 | bdl | 31.90 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.54 | bdl | 27.92 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.49 | bdl | 26.19 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.65 | bdl | 24.94 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.05 | bdl | 29.80 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.64 | bdl | 29.92 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.04 | bdl | 26.85 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 24.09 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 25.26 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.02 | bdl | 25.41 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 24.14 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 22.91 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 21.94 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 24.22 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 22.16 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 19.90 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 18.91 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 26.58 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 20.76 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 17.30 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 16.05 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.59 | bdl | 21.96 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.63 | bdl | 24.10 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.10 | bdl | 24.99 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.03 | bdl | 24.92 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.05 | bdl | 24.33 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 21.87 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.06 | bdl | 23.20 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.40 | bdl | 20.53 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.41 | bdl | 20.59 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.09 | bdl | 19.15 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.04 | bdl | 18.90 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.06 | bdl | 18.61 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 24.72 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.49 | bdl | 25.38 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.60 | bdl | 20.47 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.58 | bdl | 18.71 | bdl | bdl | bdl | bdl | bdl | bdl |

| Cu 327.393 | Fe 238.204 | Fe 239.562 | K 766.490 | Li 670.784 | Mg 285.213 | Mn 257.610 | Mn 259.372 | Mo 202.031 |
|---|---|---|---|---|---|---|---|---|
| bdl | 0.02 | 0.02 | 10.72 | 0.03 | 26.35 | 0.98 | 0.96 | 0.01 |
| bdl | 0.09 | 0.09 | 8.67 | 0.02 | 20.08 | 0.86 | 0.84 | bdl |
| 0.01 | 0.11 | 0.11 | 8.69 | 0.02 | 16.91 | 0.76 | 0.74 | bdl |
| bdl | 0.08 | 0.08 | 7.47 | 0.01 | 15.54 | 0.72 | 0.70 | 0.01 |
| bdl | 0.07 | 0.07 | 7.00 | 0.01 | 11.93 | 0.52 | 0.51 | bdl |
| bdl | 0.07 | 0.07 | 6.69 | 0.01 | 11.68 | 0.49 | 0.48 | bdl |
| bdl | 0.03 | 0.03 | 6.99 | 0.01 | 11.69 | 0.48 | 0.47 | bdl |
| bdl | 0.05 | 0.05 | 6.19 | 0.01 | 9.86 | 0.40 | 0.40 | bdl |
| bdl | 0.05 | 0.05 | 6.93 | 0.01 | 8.79 | 0.33 | 0.32 | bdl |
| bdl | 0.03 | 0.03 | 7.30 | bdl | 8.56 | 0.29 | 0.29 | bdl |
| bdl | 0.03 | 0.03 | 7.27 | 0.01 | 9.53 | 0.32 | 0.32 | bdl |
| bdl | 0.05 | 0.05 | 6.75 | bdl | 8.26 | 0.28 | 0.28 | bdl |
| bdl | 0.03 | 0.03 | 6.86 | 0.01 | 9.03 | 0.27 | 0.26 | 0.01 |
| bdl | 0.04 | 0.04 | 7.58 | 0.01 | 9.29 | 0.27 | 0.26 | bdl |
| bdl | 0.02 | 0.02 | 7.16 | 0.01 | 10.29 | 0.26 | 0.26 | bdl |
| bdl | 0.03 | 0.03 | 7.68 | bdl | 10.10 | 0.26 | 0.26 | bdl |
| bdl | 0.03 | 0.03 | 7.35 | bdl | 8.84 | 0.21 | 0.21 | bdl |
| 0.01 | 0.03 | 0.03 | 7.23 | bdl | 8.28 | 0.20 | 0.19 | bdl |
| bdl | 0.02 | 0.02 | 6.57 | bdl | 8.16 | 0.20 | 0.19 | bdl |
| bdl | 0.02 | 0.02 | 8.44 | 0.01 | 9.93 | 0.22 | 0.22 | bdl |
| bdl | 0.07 | 0.06 | 8.72 | bdl | 9.17 | 0.33 | 0.33 | bdl |
| bdl | 0.04 | 0.04 | 8.14 | 0.01 | 9.10 | 0.21 | 0.20 | bdl |
| 0.01 | 0.04 | 0.04 | 6.80 | bdl | 8.17 | 0.19 | 0.19 | bdl |
| bdl | 0.03 | 0.03 | 6.97 | bdl | 8.84 | 0.19 | 0.18 | bdl |
| bdl | 0.05 | 0.05 | 7.29 | bdl | 9.03 | 0.19 | 0.18 | bdl |
| bdl | 0.05 | 0.05 | 6.59 | bdl | 8.02 | 0.17 | 0.16 | bdl |
| bdl | 0.04 | 0.04 | 6.89 | bdl | 8.20 | 0.18 | 0.18 | bdl |
| bdl | 0.06 | 0.05 | 6.63 | bdl | 7.78 | 0.17 | 0.17 | bdl |
| bdl | 0.03 | 0.03 | 8.14 | bdl | 9.00 | 0.19 | 0.18 | bdl |
| bdl | 0.03 | 0.03 | 8.00 | bdl | 8.38 | 0.17 | 0.16 | bdl |
| bdl | 0.05 | 0.05 | 7.40 | bdl | 7.44 | 0.15 | 0.14 | bdl |
| bdl | 0.04 | 0.04 | 6.94 | bdl | 6.86 | 0.14 | 0.14 | bdl |
| bdl | bdl | bdl | 8.83 | 0.01 | 10.27 | 0.23 | 0.23 | bdl |
| bdl | bdl | bdl | 7.45 | bdl | 7.97 | 0.15 | 0.15 | bdl |
| bdl | bdl | bdl | 7.64 | bdl | 7.16 | 0.06 | 0.06 | bdl |
| bdl | bdl | bdl | 7.58 | bdl | 6.90 | 0.03 | 0.03 | bdl |
| bdl | bdl | bdl | 8.17 | bdl | 4.33 | 0.05 | 0.05 | bdl |
| bdl | bdl | bdl | 10.02 | bdl | 6.57 | 0.04 | 0.04 | bdl |
| bdl | 0.01 | 0.01 | 11.30 | bdl | 7.26 | 0.03 | 0.03 | bdl |
| bdl | bdl | bdl | 11.77 | bdl | 7.25 | 0.03 | 0.02 | bdl |
| bdl | bdl | bdl | 11.70 | bdl | 6.51 | 0.02 | 0.02 | bdl |
| bdl | bdl | bdl | 9.59 | bdl | 5.53 | 0.02 | 0.02 | bdl |
| bdl | 0.01 | 0.01 | 9.55 | bdl | 5.18 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 8.22 | bdl | 4.68 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 8.41 | bdl | 4.44 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 7.95 | bdl | 4.03 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.47 | bdl | 4.13 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.38 | bdl | 4.20 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.55 | bdl | 5.26 | 0.02 | 0.02 | bdl |
| bdl | 0.01 | 0.01 | 17.17 | bdl | 5.82 | 0.02 | 0.02 | bdl |
| bdl | bdl | bdl | 10.01 | bdl | 4.38 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 8.39 | bdl | 4.56 | 0.02 | 0.02 | bdl |

| Na 330.237 | Ni 231.604 | P 213.617 | Pb 220.353 | S 180.669 | Sb 206.836 | Se 196.026 | Si 212.412 | Si 251.611 |
|---|---|---|---|---|---|---|---|---|
| 14.78 | bdl | bdl | bdl | 90.69 | bdl | 0.04 | 5.88 | 5.93 |
| 15.54 | bdl | bdl | bdl | 49.61 | bdl | 0.03 | 5.77 | 5.85 |
| 15.09 | bdl | bdl | 0.01 | 32.56 | bdl | 0.03 | 5.56 | 5.63 |
| 16.27 | bdl | 0.03 | bdl | 23.90 | bdl | 0.03 | 5.43 | 5.48 |
| 14.57 | bdl | 0.01 | bdl | 11.45 | bdl | bdl | 5.02 | 5.05 |
| 15.86 | bdl | 0.02 | 0.01 | 9.83 | bdl | 0.02 | 4.54 | 4.56 |
| 16.69 | bdl | 0.02 | bdl | 11.20 | bdl | 0.01 | 4.33 | 4.35 |
| 15.60 | bdl | 0.02 | 0.01 | 6.95 | bdl | 0.02 | 3.99 | 4.00 |
| 15.81 | bdl | bdl | 0.01 | 5.43 | bdl | 0.02 | 3.84 | 3.92 |
| 14.39 | bdl | bdl | bdl | 5.14 | bdl | bdl | 3.59 | 3.67 |
| 18.31 | bdl | bdl | bdl | 7.60 | bdl | 0.01 | 3.60 | 3.68 |
| 16.52 | bdl | bdl | bdl | 5.14 | bdl | bdl | 3.73 | 3.84 |
| 17.34 | bdl | 0.02 | bdl | 8.06 | bdl | 0.02 | 3.74 | 3.83 |
| 14.68 | bdl | bdl | bdl | 6.18 | 0.01 | 0.03 | 4.10 | 4.23 |
| 16.74 | bdl | bdl | bdl | 10.89 | 0.01 | bdl | 3.83 | 3.92 |
| 21.22 | bdl | bdl | 0.01 | 7.80 | bdl | 0.02 | 3.78 | 3.87 |
| 19.14 | bdl | 0.01 | bdl | 6.12 | bdl | 0.01 | 3.80 | 3.88 |
| 18.46 | bdl | bdl | bdl | 4.89 | bdl | 0.01 | 3.68 | 3.75 |
| 17.41 | bdl | bdl | 0.01 | 4.37 | bdl | bdl | 4.02 | 4.05 |
| 17.17 | bdl | 0.02 | bdl | 9.81 | bdl | 0.01 | 3.84 | 3.86 |
| 21.75 | bdl | 0.01 | bdl | 8.25 | bdl | bdl | 4.56 | 4.60 |
| 17.57 | bdl | bdl | bdl | 6.32 | bdl | 0.01 | 4.09 | 4.12 |
| 15.89 | bdl | bdl | bdl | 5.55 | bdl | 0.01 | 3.71 | 3.77 |
| 15.36 | bdl | bdl | bdl | 7.79 | 0.01 | 0.03 | 3.58 | 3.68 |
| 16.63 | bdl | bdl | bdl | 5.98 | 0.01 | bdl | 3.62 | 3.70 |
| 15.21 | bdl | 0.01 | bdl | 5.09 | bdl | 0.02 | 3.62 | 3.67 |
| 15.49 | bdl | 0.01 | bdl | 6.92 | 0.01 | bdl | 3.33 | 3.42 |
| 14.24 | bdl | 0.02 | 0.01 | 5.97 | bdl | bdl | 3.27 | 3.32 |
| 14.86 | bdl | 0.02 | bdl | 8.92 | bdl | 0.01 | 2.80 | 2.83 |
| 14.39 | bdl | bdl | bdl | 7.67 | bdl | 0.01 | 2.73 | 2.79 |
| 14.13 | bdl | bdl | bdl | 5.26 | bdl | 0.01 | 2.65 | 2.66 |
| 14.65 | bdl | 0.02 | bdl | 4.03 | bdl | 0.01 | 2.69 | 2.73 |
| 25.76 | bdl | bdl | bdl | 5.14 | bdl | 0.01 | 3.41 | 3.54 |
| 19.31 | bdl | 0.03 | bdl | 4.84 | bdl | bdl | 2.80 | 2.91 |
| 12.56 | bdl | 0.06 | bdl | 6.48 | bdl | bdl | 2.57 | 2.70 |
| 13.93 | bdl | 0.06 | bdl | 5.56 | bdl | bdl | 2.19 | 2.30 |
| 16.21 | bdl | bdl | bdl | 10.41 | bdl | 0.01 | 0.75 | 0.76 |
| 16.82 | bdl | bdl | bdl | 20.99 | 0.01 | 0.01 | 0.74 | 0.76 |
| 15.75 | bdl | bdl | bdl | 16.22 | 0.01 | 0.02 | 0.90 | 0.92 |
| 15.45 | bdl | bdl | bdl | 15.54 | 0.01 | 0.01 | 0.78 | 0.80 |
| 15.51 | bdl | bdl | bdl | 13.34 | 0.01 | 0.02 | 0.91 | 0.92 |
| 16.45 | bdl | 0.02 | bdl | 14.72 | 0.01 | bdl | 0.95 | 0.96 |
| 15.17 | bdl | 0.03 | bdl | 12.06 | 0.01 | bdl | 0.88 | 0.88 |
| 16.48 | bdl | 0.01 | bdl | 14.92 | bdl | bdl | 0.83 | 0.84 |
| 16.98 | bdl | 0.02 | 0.01 | 12.89 | 0.01 | bdl | 1.02 | 1.02 |
| 14.14 | bdl | 0.02 | bdl | 13.68 | 0.01 | bdl | 0.82 | 0.83 |
| 14.27 | bdl | bdl | bdl | 9.78 | 0.01 | 0.02 | 0.86 | 0.86 |
| 14.80 | bdl | bdl | 0.01 | 11.24 | 0.01 | bdl | 1.05 | 1.06 |
| 18.15 | bdl | bdl | bdl | 9.71 | bdl | 0.02 | 1.37 | 1.39 |
| 31.01 | bdl | bdl | bdl | 14.83 | 0.01 | 0.01 | 1.10 | 1.12 |
| 20.61 | bdl | bdl | bdl | 11.15 | 0.01 | bdl | 1.20 | 1.21 |
| 17.31 | bdl | bdl | bdl | 6.69 | bdl | bdl | 1.19 | 1.21 |

| Sr 421.552 | Sr 460.733 | Ti 334.940 | Tl 190.801 | V 290.880 | Zn 206.200 | Zn 213.857 |
|---|---|---|---|---|---|---|
| 0.14 | 0.15 | bdl | 0.01 | 0.01 | 0.06 | 0.07 |
| 0.09 | 0.10 | bdl | bdl | 0.01 | 0.09 | 0.09 |
| 0.08 | 0.08 | bdl | 0.01 | 0.01 | 0.09 | 0.10 |
| 0.07 | 0.07 | bdl | 0.01 | 0.01 | 0.14 | 0.14 |
| 0.05 | 0.05 | bdl | 0.01 | 0.01 | 0.06 | 0.06 |
| 0.05 | 0.05 | bdl | bdl | 0.01 | 0.09 | 0.09 |
| 0.05 | 0.05 | bdl | bdl | 0.01 | 0.08 | 0.08 |
| 0.04 | 0.04 | bdl | 0.02 | 0.01 | 0.09 | 0.09 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.03 | 0.03 |
| 0.03 | 0.04 | bdl | bdl | bdl | 0.03 | 0.04 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.07 | 0.08 |
| 0.03 | 0.04 | bdl | bdl | bdl | 0.09 | 0.09 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.11 | 0.12 |
| 0.03 | 0.04 | bdl | bdl | bdl | 0.05 | 0.05 |
| 0.04 | 0.04 | bdl | bdl | 0.01 | 0.09 | 0.09 |
| 0.02 | 0.05 | bdl | bdl | bdl | 0.05 | 0.05 |
| 0.02 | 0.04 | bdl | 0.01 | bdl | 0.07 | 0.08 |
| 0.02 | 0.04 | bdl | bdl | bdl | 0.07 | 0.07 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.08 | 0.08 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.09 | 0.09 |
| 0.05 | 0.05 | bdl | bdl | bdl | 0.14 | 0.14 |
| 0.03 | 0.04 | bdl | bdl | bdl | 0.07 | 0.07 |
| 0.03 | 0.03 | bdl | 0.01 | bdl | 0.03 | 0.03 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.02 | 0.01 |
| 0.03 | 0.03 | bdl | bdl | 0.01 | 0.04 | 0.04 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.05 | 0.05 |
| 0.03 | 0.03 | bdl | 0.01 | 0.01 | 0.02 | 0.02 |
| 0.03 | 0.03 | bdl | 0.01 | bdl | 0.02 | 0.02 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.02 | 0.03 | bdl | 0.01 | bdl | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.03 | 0.03 | bdl | bdl | 0.04 | 0.03 | 0.02 |
| 0.03 | 0.02 | bdl | bdl | 0.02 | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | 0.02 | 0.04 | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | 0.01 | 0.03 | 0.01 | 0.01 |
| 0.03 | 0.02 | bdl | 0.01 | bdl | 0.01 | 0.01 |
| 0.03 | 0.03 | bdl | 0.01 | bdl | 0.02 | 0.02 |
| 0.02 | 0.03 | bdl | 0.02 | 0.01 | 0.03 | 0.04 |
| 0.03 | 0.03 | bdl | 0.01 | 0.01 | 0.10 | 0.10 |
| 0.02 | 0.03 | bdl | 0.02 | 0.01 | 0.04 | 0.05 |
| 0.02 | 0.02 | bdl | 0.02 | 0.01 | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | 0.01 | 0.01 | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | 0.01 | 0.01 | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | 0.01 | 0.01 | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | 0.01 | 0.01 | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.00 | 0.00 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.00 | 0.00 |
| 0.03 | 0.03 | bdl | 0.01 | bdl | 0.01 | 0.01 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.04 | 0.05 |
| 0.01 | 0.03 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.02 | 0.02 |

| Sample ID | Sample Number | Ag 328.068 | Al 308.215 | Al 396.153 | As 188.979 | Au 267.595 | B 249.677 |
|---|---|---|---|---|---|---|---|
| Talbot/T7 A Ore | 23 | bdl | 0.07 | bdl | bdl | bdl | 0.12 |
| Talbot/T7 A Ore | 25 | 0.01 | bdl | 0.03 | 0.01 | bdl | 0.01 |
| Talbot/T7 A Ore | 27 | 0.01 | 0.01 | 0.04 | 0.02 | bdl | 0.01 |
| Talbot/T7 A Ore | 29 | 0.01 | 0.01 | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Ore | 35 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 A Ore | 38 | bdl | bdl | bdl | 0.02 | bdl | 0.01 |
| Talbot/T7 B Carbonate | 1 | bdl | bdl | bdl | bdl | bdl | 0.15 |
| Talbot/T7 B Carbonate | 2 | bdl | bdl | bdl | bdl | bdl | 0.14 |
| Talbot/T7 B Carbonate | 3 | bdl | bdl | 0.02 | bdl | bdl | 0.08 |
| Talbot/T7 B Carbonate | 4 | bdl | bdl | 0.01 | bdl | bdl | 0.03 |
| Talbot/T7 B Carbonate | 5 | bdl | 0.01 | 0.02 | bdl | bdl | 0.04 |
| Talbot/T7 B Carbonate | 6 | bdl | bdl | 0.01 | bdl | bdl | 0.11 |
| Talbot/T7 B Carbonate | 7 | bdl | bdl | 0.02 | bdl | bdl | 0.02 |
| Talbot/T7 B Carbonate | 8 | bdl | bdl | 0.01 | bdl | bdl | 0.08 |
| Talbot/T7 B Carbonate | 9 | bdl | bdl | 0.02 | bdl | bdl | 0.06 |
| Talbot/T7 B Carbonate | 10 | bdl | bdl | 0.01 | bdl | bdl | 0.08 |
| Talbot/T7 B Carbonate | 11 | bdl | bdl | bdl | bdl | bdl | 0.15 |
| Talbot/T7 B Carbonate | 12 | bdl | bdl | 0.03 | 0.01 | bdl | 0.01 |
| Talbot/T7 B Carbonate | 15 | bdl | 0.01 | bdl | bdl | bdl | 0.10 |
| Talbot/T7 B Carbonate | 17 | bdl | 0.01 | bdl | bdl | bdl | 0.10 |
| Talbot/T7 B Carbonate | 19 | bdl | bdl | bdl | 0.01 | bdl | 0.16 |
| Talbot/T7 B Carbonate | 21 | bdl | 0.04 | bdl | bdl | bdl | 0.15 |
| Talbot/T7 B Carbonate | 23 | bdl | 0.07 | 0.01 | 0.01 | bdl | 0.13 |
| Talbot/T7 B Carbonate | 25 | bdl | 0.04 | 0.07 | bdl | bdl | 0.02 |
| Talbot/T7 B Carbonate | 27 | 0.01 | 0.04 | 0.03 | 0.02 | bdl | 0.01 |
| Talbot/T7 B Carbonate | 29 | 0.01 | 0.04 | 0.05 | 0.01 | bdl | 0.01 |
| Talbot/T7 B Carbonate | 35 | bdl | 0.03 | bdl | 0.01 | bdl | 0.01 |
| Talbot/T7 B Carbonate | 38 | bdl | 0.01 | bdl | bdl | bdl | 0.01 |
| Talbot/T7 B Effluent | 1 | bdl | bdl | bdl | bdl | bdl | 0.22 |
| Talbot/T7 B Effluent | 2 | bdl | bdl | bdl | bdl | bdl | 0.14 |
| Talbot/T7 B Effluent | 3 | bdl | 0.01 | 0.03 | bdl | bdl | 0.08 |
| Talbot/T7 B Effluent | 4 | bdl | 0.01 | 0.03 | bdl | bdl | 0.11 |
| Talbot/T7 B Effluent | 5 | bdl | bdl | 0.03 | bdl | bdl | 0.10 |
| Talbot/T7 B Effluent | 6 | bdl | bdl | 0.02 | bdl | bdl | 0.10 |
| Talbot/T7 B Effluent | 7 | bdl | bdl | 0.03 | 0.01 | bdl | 0.07 |
| Talbot/T7 B Effluent | 8 | bdl | bdl | 0.02 | 0.01 | bdl | 0.07 |
| Talbot/T7 B Effluent | 9 | bdl | bdl | 0.02 | 0.01 | bdl | 0.07 |
| Talbot/T7 B Effluent | 10 | bdl | bdl | 0.01 | bdl | bdl | 0.07 |
| Talbot/T7 B Effluent | 11 | bdl | bdl | bdl | 0.01 | bdl | 0.06 |
| Talbot/T7 B Effluent | 12 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| Talbot/T7 B Effluent | 13 | bdl | 0.01 | 0.02 | bdl | bdl | 0.11 |
| Talbot/T7 B Effluent | 14 | bdl | bdl | bdl | bdl | bdl | 0.11 |
| Talbot/T7 B Effluent | 15 | bdl | bdl | bdl | 0.01 | bdl | 0.15 |
| Talbot/T7 B Effluent | 16 | bdl | 0.01 | bdl | bdl | bdl | 0.03 |
| Talbot/T7 B Effluent | 17 | bdl | bdl | bdl | 0.02 | bdl | 0.08 |
| Talbot/T7 B Effluent | 18 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 B Effluent | 19 | bdl | bdl | bdl | 0.01 | bdl | 0.07 |
| Talbot/T7 B Effluent | 20 | bdl | bdl | 0.01 | bdl | bdl | 0.08 |
| Talbot/T7 B Effluent | 21 | bdl | 0.02 | bdl | bdl | bdl | 0.10 |
| Talbot/T7 B Effluent | 22 | bdl | 0.04 | bdl | 0.01 | bdl | 0.04 |
| Talbot/T7 B Effluent | 23 | bdl | 0.06 | 0.01 | bdl | bdl | 0.07 |
| Talbot/T7 B Effluent | 24 | bdl | 0.07 | 0.01 | bdl | bdl | 0.03 |

| Ba 455.403 | Be 313.042 | Ca 317.933 | Cd 226.502 | Cd 228.802 | Co 228.616 | Cr 267.716 | Cr 283.563 | Cu 324.752 |
|---|---|---|---|---|---|---|---|---|
| 0.52 | bdl | 24.56 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 19.95 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | bdl | 20.90 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 20.41 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 19.91 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 19.12 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.14 | bdl | 619.97 | bdl | bdl | 0.02 | bdl | bdl | bdl |
| 0.72 | bdl | 390.29 | bdl | bdl | 0.01 | bdl | bdl | 0.01 |
| 0.08 | bdl | 133.45 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.05 | bdl | 72.29 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.07 | bdl | 43.51 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.47 | bdl | 35.48 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.05 | bdl | 30.73 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.47 | bdl | 27.40 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.42 | bdl | 28.42 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.21 | bdl | 24.48 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.41 | bdl | 23.10 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.04 | bdl | 21.33 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.52 | bdl | 21.22 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.48 | bdl | 21.82 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.53 | bdl | 20.56 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.55 | bdl | 18.49 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 23.28 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.03 | bdl | 21.11 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.03 | bdl | 20.56 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.03 | bdl | 20.14 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.03 | 0.01 | 22.50 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| 0.02 | 0.01 | 16.52 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.28 | bdl | 413.11 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.53 | bdl | 323.87 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.11 | bdl | 181.18 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.10 | bdl | 137.09 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.09 | bdl | 94.88 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.43 | bdl | 63.55 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.09 | bdl | 45.27 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.44 | bdl | 41.02 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.39 | bdl | 41.44 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.42 | bdl | 35.18 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.40 | bdl | 28.97 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.05 | bdl | 27.61 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.58 | bdl | 30.73 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.52 | bdl | 27.40 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.60 | bdl | 27.30 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.03 | bdl | 28.82 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.50 | bdl | 32.51 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.53 | bdl | 31.56 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.51 | bdl | 28.20 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.49 | bdl | 27.58 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.62 | bdl | 25.64 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.05 | bdl | 31.13 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.57 | bdl | 31.15 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.04 | bdl | 25.69 | bdl | bdl | bdl | bdl | 0.01 | bdl |

| Cu 327.393 | Fe 238.204 | Fe 239.562 | K 766.490 | Li 670.784 | Mg 285.213 | Mn 257.610 | Mn 259.372 | Mo 202.031 |
|---|---|---|---|---|---|---|---|---|
| bdl | 0.01 | 0.01 | 14.12 | bdl | 5.51 | 0.02 | 0.02 | bdl |
| bdl | 0.01 | 0.01 | 7.39 | bdl | 4.18 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 9.27 | bdl | 4.29 | 0.01 | 0.01 | bdl |
| bdl | 0.02 | 0.02 | 8.18 | bdl | 3.90 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 12.68 | bdl | 4.40 | 0.02 | 0.02 | bdl |
| bdl | bdl | bdl | 9.51 | bdl | 4.03 | 0.01 | 0.01 | bdl |
| bdl | 1.07 | 1.06 | 24.58 | 0.02 | 30.47 | 0.40 | 0.40 | 0.01 |
| bdl | bdl | bdl | 16.33 | 0.01 | 33.59 | 0.16 | 0.16 | 0.01 |
| bdl | 0.02 | 0.02 | 11.39 | 0.04 | 21.94 | 0.06 | 0.06 | 0.01 |
| bdl | bdl | bdl | 12.03 | 0.02 | 16.94 | 0.03 | 0.03 | 0.02 |
| bdl | bdl | bdl | 11.42 | 0.02 | 13.19 | 0.02 | 0.02 | bdl |
| bdl | 0.01 | 0.01 | 10.25 | 0.02 | 13.22 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 10.48 | 0.01 | 11.71 | 0.01 | 0.01 | 0.01 |
| bdl | 0.01 | 0.01 | 9.39 | 0.01 | 11.30 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 9.54 | 0.01 | 11.67 | 0.01 | 0.01 | 0.01 |
| bdl | bdl | bdl | 8.57 | 0.01 | 9.48 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.44 | 0.01 | 9.77 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 9.73 | 0.01 | 8.95 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 8.73 | 0.01 | 9.25 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 9.47 | 0.01 | 10.47 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 11.34 | bdl | 9.09 | bdl | bdl | bdl |
| bdl | 0.01 | 0.01 | 8.70 | 0.01 | 8.62 | bdl | bdl | bdl |
| bdl | 0.01 | 0.01 | 12.86 | 0.01 | 10.02 | 0.01 | 0.01 | bdl |
| 0.01 | 0.02 | 0.02 | 9.38 | bdl | 8.57 | 0.01 | 0.01 | bdl |
| 0.01 | 0.01 | 0.01 | 9.14 | bdl | 7.44 | 0.01 | 0.01 | bdl |
| 0.01 | 0.01 | 0.01 | 8.70 | bdl | 7.59 | 0.01 | 0.01 | bdl |
| 0.01 | bdl | bdl | 14.48 | 0.01 | 8.11 | bdl | bdl | bdl |
| 0.01 | bdl | bdl | 8.69 | 0.00 | 7.30 | bdl | bdl | bdl |
| bdl | 0.04 | 0.04 | Sat | 0.01 | 132.76 | 6.36 | 6.29 | 0.01 |
| bdl | 0.02 | 0.02 | 27.33 | 0.01 | 55.84 | 4.01 | 3.93 | 0.01 |
| bdl | 0.08 | 0.08 | 18.21 | 0.02 | 32.74 | 2.94 | 2.88 | bdl |
| bdl | 0.13 | 0.12 | 13.77 | 0.02 | 25.29 | 2.37 | 2.34 | 0.01 |
| bdl | 0.09 | 0.09 | 11.83 | 0.01 | 17.87 | 1.79 | 1.76 | 0.01 |
| bdl | 0.07 | 0.07 | 8.39 | 0.01 | 11.79 | 1.26 | 1.24 | 0.01 |
| bdl | 0.11 | 0.11 | 7.51 | 0.01 | 8.81 | 0.86 | 0.85 | 0.01 |
| bdl | 0.10 | 0.10 | 6.67 | 0.01 | 8.53 | 0.57 | 0.56 | bdl |
| bdl | 0.05 | 0.05 | 6.95 | 0.01 | 9.38 | 0.64 | 0.62 | bdl |
| bdl | 0.07 | 0.07 | 5.83 | 0.01 | 7.78 | 0.56 | 0.55 | bdl |
| bdl | 0.08 | 0.08 | 6.33 | 0.01 | 6.51 | 0.33 | 0.32 | bdl |
| bdl | 0.04 | 0.04 | 7.25 | bdl | 7.06 | 0.30 | 0.30 | bdl |
| bdl | 0.07 | 0.07 | 7.09 | 0.01 | 7.71 | 0.48 | 0.47 | bdl |
| bdl | 0.08 | 0.08 | 6.56 | bdl | 7.16 | 0.33 | 0.33 | bdl |
| bdl | 0.05 | 0.05 | 6.54 | bdl | 7.12 | 0.30 | 0.30 | 0.01 |
| bdl | 0.07 | 0.06 | 7.70 | bdl | 7.71 | 0.25 | 0.25 | bdl |
| bdl | 0.05 | 0.05 | 7.58 | bdl | 8.78 | 0.21 | 0.20 | bdl |
| bdl | 0.07 | 0.07 | 7.78 | bdl | 8.31 | 0.31 | 0.30 | 0.01 |
| bdl | 0.07 | 0.07 | 7.86 | bdl | 7.82 | 0.33 | 0.33 | bdl |
| 0.01 | 0.09 | 0.09 | 7.77 | bdl | 7.32 | 0.31 | 0.30 | bdl |
| bdl | 0.06 | 0.06 | 6.51 | bdl | 7.06 | 0.26 | 0.26 | bdl |
| bdl | 0.06 | 0.06 | 8.80 | bdl | 9.03 | 0.35 | 0.35 | bdl |
| bdl | 0.03 | 0.03 | 8.70 | 0.01 | 10.80 | 0.22 | 0.21 | bdl |
| bdl | 0.08 | 0.08 | 8.10 | bdl | 7.66 | 0.33 | 0.32 | bdl |

| Na 330.237 | Ni 231.604 | P 213.617 | Pb 220.353 | S 180.669 | Sb 206.836 | Se 196.026 | Si 212.412 | Si 251.611 |
|---|---|---|---|---|---|---|---|---|
| 25.59 | bdl | bdl | bdl | 13.41 | bdl | 0.02 | 1.76 | 1.78 |
| 13.85 | bdl | bdl | 0.01 | 7.24 | bdl | 0.02 | 1.03 | 1.03 |
| 17.05 | bdl | bdl | bdl | 8.20 | 0.01 | 0.01 | 1.50 | 1.51 |
| 15.20 | bdl | bdl | bdl | 9.06 | bdl | bdl | 1.46 | 1.46 |
| 17.20 | bdl | 0.01 | bdl | 8.82 | bdl | bdl | 1.21 | 1.25 |
| 13.88 | bdl | 0.06 | bdl | 7.95 | bdl | 0.01 | 1.53 | 1.58 |
| 17.23 | bdl | bdl | 0.02 | 489.25 | bdl | 0.09 | 7.17 | 7.21 |
| 17.42 | bdl | bdl | 0.01 | 301.91 | bdl | 0.09 | 5.93 | 6.00 |
| 17.29 | bdl | bdl | 0.01 | 91.88 | bdl | 0.07 | 4.12 | 4.23 |
| 17.15 | bdl | bdl | 0.01 | 37.72 | bdl | 0.04 | 3.38 | 3.51 |
| 15.91 | bdl | bdl | bdl | 18.88 | bdl | 0.05 | 2.82 | 2.89 |
| 17.79 | bdl | 0.02 | bdl | 17.47 | bdl | bdl | 2.97 | 3.04 |
| 15.16 | bdl | 0.02 | 0.02 | 11.67 | bdl | bdl | 2.30 | 2.32 |
| 17.49 | bdl | 0.01 | bdl | 11.90 | 0.01 | bdl | 2.27 | 2.30 |
| 17.28 | bdl | 0.02 | bdl | 11.20 | bdl | bdl | 2.14 | 2.16 |
| 16.02 | bdl | 0.03 | bdl | 11.48 | bdl | bdl | 2.02 | 2.04 |
| 17.38 | bdl | bdl | 0.01 | 9.17 | 0.01 | 0.02 | 2.37 | 2.41 |
| 14.78 | bdl | bdl | bdl | 9.45 | bdl | bdl | 1.62 | 1.64 |
| 16.94 | bdl | bdl | bdl | 7.87 | 0.01 | 0.03 | 1.73 | 1.75 |
| 18.14 | bdl | bdl | bdl | 8.75 | bdl | 0.01 | 1.82 | 1.86 |
| 22.75 | bdl | 0.01 | bdl | 9.83 | 0.01 | 0.02 | 1.89 | 1.91 |
| 18.80 | bdl | bdl | bdl | 7.69 | bdl | bdl | 1.79 | 1.81 |
| 22.59 | bdl | bdl | 0.01 | 11.06 | bdl | 0.01 | 1.81 | 1.84 |
| 15.40 | bdl | bdl | bdl | 8.92 | 0.01 | 0.01 | 1.59 | 1.60 |
| 15.94 | bdl | bdl | bdl | 7.65 | bdl | bdl | 1.56 | 1.57 |
| 15.10 | bdl | bdl | bdl | 7.68 | bdl | bdl | 1.51 | 1.52 |
| 30.07 | bdl | bdl | bdl | 8.95 | bdl | bdl | 1.56 | 1.62 |
| 13.57 | bdl | 0.04 | bdl | 6.80 | 0.01 | bdl | 1.47 | 1.52 |
| 19.70 | bdl | 0.02 | 0.01 | 463.72 | bdl | 0.10 | 9.30 | 9.38 |
| 15.91 | bdl | bdl | 0.01 | 289.23 | bdl | 0.06 | 7.79 | 7.82 |
| 14.34 | bdl | bdl | 0.01 | 142.34 | bdl | 0.07 | 8.47 | 8.59 |
| 16.15 | bdl | bdl | 0.01 | 101.26 | bdl | 0.04 | 8.54 | 8.65 |
| 15.25 | bdl | bdl | bdl | 56.85 | bdl | 0.06 | 8.56 | 8.69 |
| 15.38 | bdl | 0.04 | 0.01 | 23.39 | bdl | 0.01 | 7.77 | 7.81 |
| 14.00 | bdl | 0.03 | bdl | 8.40 | bdl | 0.01 | 7.51 | 7.56 |
| 16.16 | bdl | 0.02 | bdl | 7.09 | bdl | bdl | 6.96 | 6.96 |
| 16.62 | bdl | 0.02 | bdl | 10.69 | bdl | bdl | 6.52 | 6.56 |
| 15.62 | bdl | 0.02 | bdl | 6.00 | bdl | bdl | 6.93 | 6.96 |
| 15.39 | bdl | 0.01 | 0.01 | 4.88 | bdl | 0.02 | 6.21 | 6.31 |
| 14.41 | bdl | bdl | bdl | 4.68 | bdl | 0.01 | 5.86 | 5.94 |
| 18.83 | bdl | 0.01 | 0.01 | 6.72 | bdl | 0.01 | 4.87 | 4.98 |
| 17.20 | bdl | 0.01 | bdl | 4.43 | 0.01 | bdl | 5.63 | 5.76 |
| 17.60 | bdl | 0.02 | bdl | 5.57 | bdl | bdl | 5.17 | 5.23 |
| 14.92 | bdl | bdl | 0.01 | 4.57 | bdl | bdl | 5.13 | 5.21 |
| 16.85 | bdl | 0.01 | bdl | 7.55 | bdl | 0.01 | 5.28 | 5.37 |
| 19.89 | bdl | bdl | bdl | 5.26 | bdl | 0.02 | 4.96 | 5.05 |
| 19.19 | bdl | bdl | 0.01 | 4.00 | bdl | 0.03 | 4.59 | 4.65 |
| 19.87 | bdl | bdl | bdl | 4.04 | 0.01 | 0.03 | 4.24 | 4.33 |
| 17.23 | bdl | 0.01 | bdl | 2.22 | bdl | 0.01 | 5.26 | 5.30 |
| 17.91 | bdl | bdl | 0.01 | 7.68 | bdl | 0.02 | 5.10 | 5.15 |
| 21.37 | bdl | bdl | bdl | 9.17 | bdl | 0.01 | 4.10 | 4.12 |
| 17.09 | bdl | bdl | 0.01 | 4.07 | bdl | 0.01 | 4.89 | 4.93 |

| Sr 421.552 | Sr 460.733 | Ti 334.940 | Tl 190.801 | V 290.880 | Zn 206.200 | Zn 213.857 |
|---|---|---|---|---|---|---|
| 0.03 | 0.03 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.28 | 0.28 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.14 | 0.14 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.18 | 0.18 |
| 0.02 | 0.02 | bdl | 0.01 | 0.03 | 0.21 | 0.22 |
| 0.02 | 0.02 | bdl | 0.01 | 0.02 | 0.07 | 0.07 |
| 0.65 | 0.72 | bdl | bdl | bdl | 1.25 | 1.37 |
| 0.44 | 0.47 | bdl | bdl | 0.01 | 0.45 | 0.49 |
| 0.16 | 0.18 | bdl | 0.01 | 0.01 | 0.15 | 0.16 |
| 0.10 | 0.11 | bdl | 0.03 | 0.01 | 0.06 | 0.07 |
| 0.07 | 0.07 | bdl | bdl | 0.01 | 0.04 | 0.04 |
| 0.06 | 0.06 | bdl | bdl | 0.01 | 0.03 | 0.03 |
| 0.05 | 0.05 | bdl | bdl | 0.01 | 0.05 | 0.05 |
| 0.05 | 0.05 | bdl | 0.02 | 0.01 | 0.02 | 0.02 |
| 0.05 | 0.05 | bdl | bdl | 0.01 | 0.02 | 0.03 |
| 0.04 | 0.04 | bdl | 0.01 | 0.01 | 0.02 | 0.02 |
| 0.04 | 0.05 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.02 | 0.04 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.03 | 0.04 | bdl | bdl | bdl | 0.02 | 0.01 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.03 | 0.03 |
| 0.03 | 0.03 | bdl | bdl | 0.01 | 0.11 | 0.10 |
| 0.03 | 0.03 | bdl | bdl | 0.01 | 0.08 | 0.08 |
| 0.03 | 0.03 | bdl | 0.01 | bdl | 0.10 | 0.10 |
| 0.03 | 0.03 | bdl | bdl | 0.03 | 0.12 | 0.12 |
| 0.02 | 0.02 | bdl | 0.01 | 0.02 | 0.09 | 0.09 |
| 0.66 | 0.71 | bdl | bdl | 0.01 | 0.21 | 0.23 |
| 0.47 | 0.48 | bdl | bdl | 0.01 | 0.19 | 0.21 |
| 0.21 | 0.24 | bdl | bdl | 0.01 | 0.07 | 0.08 |
| 0.16 | 0.18 | bdl | bdl | 0.01 | 0.08 | 0.08 |
| 0.12 | 0.13 | bdl | bdl | 0.01 | 0.08 | 0.08 |
| 0.07 | 0.08 | bdl | bdl | 0.01 | 0.16 | 0.16 |
| 0.05 | 0.06 | bdl | bdl | 0.01 | 0.07 | 0.07 |
| 0.05 | 0.05 | bdl | bdl | 0.01 | 0.14 | 0.14 |
| 0.05 | 0.06 | bdl | 0.02 | 0.01 | 0.12 | 0.12 |
| 0.04 | 0.05 | bdl | 0.01 | 0.01 | 0.14 | 0.13 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.09 | 0.09 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.04 | 0.04 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.11 | 0.11 |
| 0.04 | 0.04 | bdl | 0.01 | bdl | 0.12 | 0.12 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.12 | 0.12 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.05 | 0.05 |
| 0.04 | 0.04 | bdl | 0.01 | bdl | 0.16 | 0.16 |
| 0.02 | 0.05 | bdl | 0.01 | bdl | 0.10 | 0.10 |
| 0.02 | 0.04 | bdl | bdl | bdl | 0.10 | 0.10 |
| 0.02 | 0.04 | bdl | bdl | bdl | 0.12 | 0.12 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.13 | 0.13 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.08 | 0.08 |
| 0.04 | 0.04 | bdl | bdl | bdl | 0.10 | 0.10 |
| 0.03 | 0.04 | bdl | bdl | bdl | 0.07 | 0.07 |

| Sample ID | Sample Number | Ag 328.068 | Al 308.215 | Al 396.153 | As 188.979 | Au 267.595 | B 249.677 |
|---|---|---|---|---|---|---|---|
| Talbot/T7 B Effluent | 25 | bdl | 0.01 | 0.04 | 0.01 | bdl | 0.02 |
| Talbot/T7 B Effluent | 26 | 0.01 | bdl | 0.01 | 0.01 | bdl | 0.01 |
| Talbot/T7 B Effluent | 27 | bdl | 0.02 | 0.05 | 0.02 | bdl | 0.01 |
| Talbot/T7 B Effluent | 28 | 0.01 | 0.01 | 0.01 | bdl | bdl | 0.01 |
| Talbot/T7 B Effluent | 29 | 0.01 | 0.01 | 0.02 | 0.02 | bdl | 0.01 |
| Talbot/T7 B Effluent | 30 | 0.01 | bdl | bdl | 0.02 | bdl | 0.02 |
| Talbot/T7 B Effluent | 31 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 B Effluent | 32 | bdl | 0.06 | 0.03 | bdl | bdl | 0.34 |
| Talbot/T7 B Effluent | 33 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 B Effluent | 34 | bdl | 0.06 | 0.04 | bdl | bdl | 0.01 |
| Talbot/T7 B Effluent | 35 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 B Effluent | 36 | bdl | 0.01 | bdl | 0.01 | bdl | 0.01 |
| Talbot/T7 B Effluent | 37 | bdl | bdl | bdl | 0.01 | bdl | 0.02 |
| Talbot/T7 B Effluent | 38 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 B Ore | 1 | bdl | bdl | bdl | bdl | bdl | 0.11 |
| Talbot/T7 B Ore | 2 | bdl | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 B Ore | 3 | bdl | 0.01 | 0.02 | bdl | bdl | 0.06 |
| Talbot/T7 B Ore | 4 | bdl | bdl | 0.01 | bdl | bdl | 0.02 |
| Talbot/T7 B Ore | 5 | bdl | bdl | 0.02 | bdl | bdl | 0.03 |
| Talbot/T7 B Ore | 6 | bdl | bdl | 0.02 | bdl | bdl | 0.09 |
| Talbot/T7 B Ore | 7 | bdl | bdl | 0.01 | bdl | bdl | 0.03 |
| Talbot/T7 B Ore | 8 | bdl | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 B Ore | 9 | bdl | bdl | 0.02 | bdl | bdl | 0.08 |
| Talbot/T7 B Ore | 10 | bdl | bdl | 0.01 | bdl | bdl | 0.04 |
| Talbot/T7 B Ore | 11 | bdl | bdl | bdl | 0.01 | bdl | 0.01 |
| Talbot/T7 B Ore | 12 | bdl | bdl | bdl | bdl | bdl | 0.03 |
| Talbot/T7 B Ore | 15 | bdl | bdl | 0.01 | bdl | bdl | 0.10 |
| Talbot/T7 B Ore | 17 | bdl | bdl | 0.01 | bdl | bdl | 0.10 |
| Talbot/T7 B Ore | 19 | bdl | bdl | bdl | 0.01 | bdl | 0.13 |
| Talbot/T7 B Ore | 21 | bdl | 0.04 | bdl | 0.01 | bdl | 0.15 |
| Talbot/T7 B Ore | 23 | bdl | 0.07 | 0.01 | bdl | bdl | 0.12 |
| Talbot/T7 B Ore | 25 | bdl | 0.01 | 0.04 | bdl | bdl | 0.02 |
| Talbot/T7 B Ore | 27 | 0.01 | 0.01 | 0.02 | 0.01 | bdl | 0.03 |
| Talbot/T7 B Ore | 29 | 0.01 | bdl | 0.01 | bdl | bdl | 0.02 |
| Talbot/T7 B Ore | 35 | bdl | bdl | bdl | 0.01 | bdl | 0.02 |
| Talbot/T7 B Ore | 38 | bdl | bdl | bdl | bdl | bdl | 0.01 |

| Ba 455.403 | Be 313.042 | Ca 317.933 | Cd 226.502 | Cd 228.802 | Co 228.616 | Cr 267.716 | Cr 283.563 | Cu 324.752 |
|---|---|---|---|---|---|---|---|---|
| 0.01 | bdl | 24.36 | bdl | bdl | bdl | bdl | bdl | 0.04 |
| 0.01 | bdl | 25.06 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | bdl | 23.31 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | bdl | 22.36 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | bdl | 21.40 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.13 | bdl | 19.98 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 22.69 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.14 | bdl | 21.67 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 20.11 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | bdl | 17.98 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 25.63 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 19.20 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 17.14 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 17.70 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.62 | bdl | 25.41 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.65 | bdl | 22.77 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.09 | bdl | 18.31 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.03 | bdl | 16.72 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.04 | bdl | 17.85 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.44 | bdl | 18.40 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.05 | bdl | 19.43 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.40 | bdl | 18.23 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.49 | bdl | 18.33 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.08 | bdl | 18.31 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.04 | bdl | 15.53 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.06 | bdl | 15.82 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.42 | bdl | 20.82 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.47 | bdl | 25.18 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.53 | bdl | 22.43 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.57 | bdl | 25.61 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.45 | bdl | 25.09 | bdl | bdl | bdl | bdl | 0.01 | bdl |
| 0.01 | bdl | 19.38 | bdl | bdl | bdl | bdl | bdl | 0.02 |
| 0.02 | bdl | 21.84 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.02 | bdl | 20.21 | bdl | bdl | bdl | bdl | bdl | bdl |
| 0.01 | 0.01 | 19.02 | bdl | bdl | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.01 | 18.53 | bdl | bdl | bdl | bdl | bdl | bdl |

| Cu 327.393 | Fe 238.204 | Fe 239.562 | K 766.490 | Li 670.784 | Mg 285.213 | Mn 257.610 | Mn 259.372 | Mo 202.031 |
|---|---|---|---|---|---|---|---|---|
| 0.04 | 0.25 | 0.24 | 6.76 | bdl | 7.00 | 0.30 | 0.29 | 0.01 |
| 0.01 | 0.07 | 0.07 | 6.82 | bdl | 7.11 | 0.30 | 0.29 | bdl |
| bdl | 0.08 | 0.08 | 6.82 | bdl | 7.01 | 0.28 | 0.27 | bdl |
| 0.01 | 0.08 | 0.08 | 6.78 | bdl | 6.44 | 0.22 | 0.22 | bdl |
| 0.01 | 0.06 | 0.06 | 6.85 | bdl | 6.55 | 0.29 | 0.28 | 0.01 |
| bdl | 0.07 | 0.06 | 6.56 | bdl | 6.10 | 0.25 | 0.24 | bdl |
| bdl | 0.02 | 0.02 | 8.37 | bdl | 7.24 | 0.25 | 0.25 | bdl |
| bdl | 0.04 | 0.04 | 8.27 | bdl | 7.25 | 0.27 | 0.26 | bdl |
| bdl | 0.08 | 0.08 | 7.51 | bdl | 6.17 | 0.33 | 0.32 | bdl |
| bdl | 0.05 | 0.05 | 7.44 | bdl | 5.86 | 0.21 | 0.21 | bdl |
| bdl | bdl | bdl | 10.33 | bdl | 8.95 | 0.43 | 0.42 | bdl |
| bdl | bdl | bdl | 8.50 | bdl | 6.77 | 0.15 | 0.15 | bdl |
| bdl | bdl | bdl | 8.02 | bdl | 6.17 | 0.16 | 0.15 | bdl |
| bdl | bdl | bdl | 8.27 | bdl | 7.08 | 0.08 | 0.08 | bdl |
| bdl | bdl | bdl | 8.27 | bdl | 4.58 | 0.04 | 0.04 | bdl |
| bdl | 0.01 | 0.01 | 8.62 | bdl | 4.46 | 0.02 | 0.02 | 0.01 |
| bdl | 0.01 | 0.01 | 10.69 | bdl | 3.66 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 11.82 | bdl | 3.65 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 12.16 | bdl | 4.31 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 10.26 | bdl | 5.21 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 10.55 | bdl | 5.55 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.80 | bdl | 5.18 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.55 | bdl | 4.92 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 8.65 | bdl | 4.63 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.39 | bdl | 3.73 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.40 | bdl | 3.85 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 9.73 | bdl | 4.79 | 0.02 | 0.02 | bdl |
| bdl | bdl | bdl | 24.14 | bdl | 6.05 | 0.02 | 0.02 | bdl |
| bdl | 0.01 | 0.01 | 11.53 | bdl | 5.02 | 0.02 | 0.02 | bdl |
| bdl | 0.01 | 0.01 | 9.50 | bdl | 6.13 | 0.02 | 0.02 | bdl |
| bdl | 0.01 | 0.01 | 13.31 | bdl | 6.25 | 0.02 | 0.02 | bdl |
| 0.01 | 0.01 | 0.01 | 9.45 | bdl | 4.82 | 0.02 | 0.02 | bdl |
| 0.01 | 0.03 | 0.03 | 9.86 | bdl | 5.27 | 0.01 | 0.01 | bdl |
| bdl | 0.01 | 0.01 | 8.82 | bdl | 4.74 | 0.02 | 0.02 | bdl |
| bdl | bdl | bdl | 11.60 | bdl | 4.34 | 0.01 | 0.01 | bdl |
| bdl | bdl | bdl | 9.43 | bdl | 4.31 | 0.01 | 0.01 | bdl |

| Na 330.237 | Ni 231.604 | P 213.617 | Pb 220.353 | S 180.669 | Sb 206.836 | Se 196.026 | Si 212.412 | Si 251.611 |
|---|---|---|---|---|---|---|---|---|
| 16.11 | bdl | bdl | 0.01 | 3.32 | bdl | 0.02 | 4.70 | 4.81 |
| 15.19 | bdl | bdl | bdl | 5.63 | bdl | 0.01 | 4.47 | 4.56 |
| 15.71 | bdl | 0.02 | bdl | 3.66 | bdl | 0.00 | 4.32 | 4.42 |
| 15.38 | bdl | bdl | bdl | 3.41 | bdl | 0.01 | 4.34 | 4.42 |
| 15.34 | bdl | bdl | bdl | 5.16 | bdl | bdl | 3.95 | 4.03 |
| 14.55 | bdl | bdl | bdl | 4.19 | 0.01 | bdl | 3.64 | 3.69 |
| 15.07 | bdl | 0.01 | 0.01 | 7.35 | bdl | 0.02 | 3.10 | 3.14 |
| 15.44 | bdl | 0.02 | bdl | 7.33 | bdl | 0.01 | 3.49 | 3.53 |
| 14.00 | bdl | 0.02 | 0.01 | 3.83 | bdl | 0.01 | 3.22 | 3.27 |
| 14.67 | bdl | 0.01 | bdl | 3.64 | bdl | 0.01 | 2.25 | 2.26 |
| 25.86 | bdl | bdl | bdl | 5.64 | bdl | bdl | 2.73 | 2.83 |
| 17.39 | bdl | 0.01 | bdl | 4.52 | bdl | bdl | 2.30 | 2.40 |
| 12.80 | bdl | 0.04 | bdl | 5.35 | bdl | 0.01 | 2.66 | 2.72 |
| 13.83 | bdl | 0.05 | bdl | 5.13 | bdl | bdl | 2.00 | 2.12 |
| 16.67 | bdl | bdl | bdl | 11.45 | bdl | 0.01 | 0.90 | 0.91 |
| 18.34 | bdl | bdl | 0.01 | 11.14 | 0.01 | 0.02 | 0.75 | 0.75 |
| 15.97 | bdl | bdl | bdl | 12.26 | 0.01 | bdl | 0.77 | 0.78 |
| 15.57 | bdl | bdl | bdl | 12.47 | bdl | 0.01 | 0.59 | 0.60 |
| 16.10 | bdl | bdl | bdl | 12.40 | bdl | bdl | 0.75 | 0.76 |
| 17.55 | bdl | 0.01 | bdl | 22.85 | bdl | bdl | 0.98 | 0.99 |
| 15.65 | bdl | 0.01 | 0.01 | 15.66 | bdl | bdl | 0.88 | 0.89 |
| 17.76 | bdl | 0.02 | 0.01 | 13.68 | bdl | bdl | 0.95 | 0.97 |
| 18.00 | bdl | 0.01 | bdl | 12.24 | bdl | bdl | 0.96 | 0.97 |
| 15.17 | bdl | 0.01 | bdl | 12.80 | 0.01 | 0.01 | 0.92 | 0.93 |
| 14.48 | bdl | bdl | bdl | 9.43 | 0.01 | 0.02 | 0.85 | 0.86 |
| 14.65 | bdl | bdl | bdl | 11.30 | 0.01 | 0.01 | 0.99 | 1.00 |
| 18.74 | bdl | bdl | bdl | 7.88 | 0.01 | 0.01 | 1.35 | 1.36 |
| 29.21 | bdl | bdl | bdl | 15.78 | 0.01 | 0.02 | 1.14 | 1.16 |
| 21.80 | bdl | bdl | 0.01 | 12.28 | 0.01 | 0.02 | 1.56 | 1.57 |
| 19.07 | bdl | bdl | bdl | 16.54 | 0.01 | 0.01 | 1.39 | 1.40 |
| 24.66 | bdl | bdl | bdl | 11.84 | bdl | 0.01 | 1.81 | 1.83 |
| 16.31 | bdl | bdl | bdl | 9.10 | 0.02 | bdl | 1.11 | 1.13 |
| 16.44 | bdl | bdl | bdl | 8.72 | bdl | 0.02 | 1.70 | 1.72 |
| 15.26 | bdl | bdl | bdl | 8.00 | 0.01 | 0.01 | 1.65 | 1.67 |
| 20.75 | bdl | 0.01 | bdl | 8.54 | bdl | bdl | 1.29 | 1.34 |
| 13.66 | bdl | 0.06 | bdl | 8.90 | bdl | bdl | 1.48 | 1.53 |

| Sr 421.552 | Sr 460.733 | Ti 334.940 | Tl 190.801 | V 290.880 | Zn 206.200 | Zn 213.857 |
|---|---|---|---|---|---|---|
| 0.03 | 0.03 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.03 | 0.03 | bdl | bdl | 0.01 | 0.02 | 0.02 |
| 0.03 | 0.03 | bdl | bdl | 0.01 | 0.03 | 0.03 |
| 0.03 | 0.03 | bdl | 0.01 | 0.01 | 0.03 | 0.03 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.03 | 0.03 |
| 0.03 | 0.03 | bdl | 0.01 | bdl | 0.15 | 0.15 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.03 | 0.03 | bdl | 0.01 | bdl | 0.08 | 0.08 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | 0.01 | bdl | 0.01 | 0.01 |
| 0.03 | 0.03 | bdl | bdl | 0.03 | 0.01 | 0.01 |
| 0.03 | 0.03 | bdl | 0.01 | 0.02 | 0.01 | 0.01 |
| 0.02 | 0.03 | bdl | 0.01 | 0.03 | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | 0.01 | 0.04 | 0.00 | 0.01 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.03 | 0.02 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | bdl | 0.01 | 0.02 | 0.02 |
| 0.01 | 0.02 | bdl | bdl | 0.01 | 0.01 | 0.01 |
| 0.01 | 0.02 | bdl | 0.02 | bdl | 0.01 | 0.01 |
| 0.01 | 0.02 | bdl | 0.01 | 0.01 | 0.01 | 0.01 |
| 0.01 | 0.02 | bdl | 0.01 | 0.01 | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | 0.01 | 0.01 | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | 0.02 | 0.01 | 0.01 | 0.01 |
| 0.01 | 0.02 | bdl | 0.01 | 0.01 | 0.03 | 0.03 |
| 0.01 | 0.01 | bdl | bdl | 0.00 | 0.00 | 0.00 |
| 0.01 | 0.01 | bdl | bdl | bdl | 0.00 | 0.00 |
| 0.02 | 0.02 | bdl | 0.02 | bdl | 0.01 | 0.01 |
| 0.02 | 0.02 | bdl | 0.01 | bdl | 0.01 | 0.01 |
| 0.01 | 0.03 | bdl | 0.02 | bdl | 0.01 | 0.01 |
| 0.03 | 0.03 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.03 | 0.04 | bdl | bdl | bdl | 0.02 | 0.02 |
| 0.02 | 0.02 | bdl | bdl | 0.01 | 0.23 | 0.22 |
| 0.03 | 0.03 | bdl | bdl | 0.00 | 0.17 | 0.17 |
| 0.02 | 0.02 | bdl | bdl | bdl | 0.28 | 0.28 |
| 0.02 | 0.02 | bdl | 0.01 | 0.03 | 0.14 | 0.14 |
| 0.02 | 0.02 | bdl | 0.01 | 0.02 | 0.06 | 0.07 |

** All cation concentrations are in ppm.

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) | Ba (ppb) | Be (ppb) |
|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | |
| Talbot/T7 A Soil Top | 7.0 | 1345.0 | 151.5 | 6.5 | 6792.0 | 41.5 |
| Talbot/T7 A Soil Bottom | 1.5 | 456.0 | 36.0 | 3.5 | 2515.5 | 9.0 |
| Talbot/T7 B Soil Top | 1.3 | 535.5 | 66.5 | 2.0 | 2334.0 | 16.5 |
| Talbot/T7 B Soil Bottom | 0.7 | 242.0 | 26.5 | <1 | 1037.5 | 5.0 |
| Arrieros/LB A Soil Top | <0.5 | 166.0 | 174.0 | <1 | 510.5 | 7.5 |
| Arrieros/LB A Soil Bottom | <0.5 | 145.0 | 168.5 | <1 | 473.0 | 6.5 |
| Arrieros/LB A Grav Top | <0.5 | 104.0 | 35.5 | <1 | 350.5 | 3.5 |
| Arrieros/LB A Grav Bottom | <0.5 | 94.5 | 49.5 | <1 | 548.0 | 2.0 |
| Arrieros/LB B Soil Top | <0.5 | 156.5 | 182.0 | <1 | 493.0 | 4.0 |
| Arrieros/LB B Soil Bottom | 0.5 | 140.5 | 162.0 | <1 | 431.5 | 6.0 |
| Arrieros/LB B Grav Top | <0.5 | 133.5 | 47.5 | <1 | 445.5 | 4.5 |
| Arrieros/LB B Grav Bottom | <0.5 | 123.0 | 55.0 | <1 | 713.0 | 4.5 |
| Raglan A Soil Top | <0.5 | 9.0 | 50.0 | 3.0 | 1201.0 | 1.0 |
| Raglan A Soil Bottom | <0.5 | 17.0 | 48.0 | 1.0 | 947.5 | 2.0 |
| Raglan A Till Top | 1.7 | 214.0 | 44.5 | 1.0 | 1609.5 | 5.5 |
| Raglan A Till Middle | 0.9 | 197.5 | 57.0 | <1 | 1325.5 | 6.0 |
| Raglan A Till Bottom | <0.5 | 8.0 | <5 | <1 | 2162.5 | 6.5 |
| Raglan B Soil Top | <0.5 | 9.0 | 42.0 | 2.0 | 1238.5 | 3.0 |
| Raglan B Soil Bottom | <0.5 | 16.5 | 61.0 | 2.0 | 2134.5 | 5.0 |
| Raglan B Till Top | 0.9 | 67.0 | 67.0 | 1.0 | 897.5 | 2.0 |
| Raglan B Till Middle | 1.3 | 141.0 | 31.0 | <1 | 1150.5 | 5.0 |
| Raglan B Till Bottom | <0.5 | 17.5 | <5 | <1 | 770.0 | 6.5 |
| Talbot/T7 A Carb Top | <0.5 | <1 | <5 | 2 | 47 | <1 |
| Talbot/T7 A Carb Middle | <0.5 | <1 | <5 | <1 | 34 | <1 |
| Talbot/T7 A Carb Bottom | <0.5 | <1 | <5 | <1 | 44 | <1 |
| Talbot/T7 B Carb Top | <0.5 | <1 | <5 | 2 | 30 | <1 |
| Talbot/T7 B Carb Middle | <0.5 | <1 | <5 | <1 | 54 | <1 |
| Talbot/T7 B Carb Bottom | <0.5 | <1 | <5 | <1 | 28 | <1 |
| | | | | | | |
| Na-pyrophosphate extraction | | | | | | |
| Talbot/T7 A Soil Top | 41 | 13389 | 1645 | 18 | 50787 | 256 |
| Talbot/T7 A Soil Bottom | 14 | 5169 | 559 | 12 | 17118 | 104 |
| Talbot/T7 B Soil Top | 28 | 14521 | 1664 | 34 | 49142 | 366 |
| Talbot/T7 B Soil Bottom | 10 | 3356 | 438 | 9 | 9486 | 39 |
| Arrieros/LB A Soil Top | <3 | 177 | 302 | <1 | 729 | <20 |
| Arrieros/LB A Soil Bottom | <3 | 151 | 285 | 1 | 596 | <20 |
| Arrieros/LB A Grav Top | <3 | 1186 | 330 | 8 | 1416 | 38 |
| Arrieros/LB A Grav Bottom | <3 | 945 | 314 | 6 | 1380 | <20 |
| Arrieros/LB B Soil Top | <3 | 187 | 329 | 3 | 726 | <20 |
| Arrieros/LB B Soil Bottom | <3 | 151 | 359 | <1 | 729 | <20 |
| Arrieros/LB B Grav Top | <3 | 1341 | 278 | <1 | 1825 | 37 |
| Arrieros/LB B Grav Bottom | <3 | 1504 | 450 | 3 | 2080 | 103 |
| Raglan A Soil Top | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| Raglan A Soil Bottom | 16 | 1197 | 814 | 14 | 12538 | 27 |
| Raglan A Till Top | 4 | 583 | 278 | 8 | 2701 | <20 |
| Raglan A Till Middle | <3 | 817 | 454 | 3 | 3200 | <20 |
| Raglan A Till Bottom | 6 | 402 | 166 | 19 | 1596 | <20 |
| Raglan B Soil Top | 25 | 1130 | 721 | 35 | 11011 | 69 |
| Raglan B Soil Bottom | 12 | 1149 | 750 | 43 | 13260 | 69 |
| Raglan B Till Top | 6 | 788 | 597 | 11 | 5679 | 79 |
| Raglan B Till Middle | <3 | 349 | 153 | <1 | 1433 | 57 |
| Raglan B Till Bottom | 4 | 582 | 245 | 13 | 2378 | <20 |

| Bi (ppb) | Br (ppb) | Cd (ppb) | Ce (ppb) | Cl (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) | Dy (ppb) |
|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | |
| 8.0 | 515.5 | 2.4 | 1653.0 | 16.5 | 286.0 | 115.1 | 785.5 | 57.3 |
| 2.8 | 245.5 | 0.7 | 500.5 | 16.5 | 103.0 | 39.5 | 234.5 | 14.4 |
| 2.8 | 261.0 | 0.9 | 461.0 | 16.0 | 142.0 | 47.4 | 234.5 | 10.2 |
| 2.1 | 138.0 | 0.6 | 172.5 | 7.5 | 69.5 | 21.5 | 96.5 | 3.8 |
| 0.8 | 137.5 | 1.1 | 118.0 | 9.0 | 30.5 | 84.3 | 200.0 | 3.7 |
| 0.7 | 174.5 | 1.1 | 77.5 | 8.5 | 27.5 | 73.2 | 169.0 | 3.6 |
| 0.7 | 52.0 | <0.5 | 103.0 | 5.0 | 25.5 | 15.2 | 71.0 | 3.4 |
| 0.9 | 44.0 | 3.8 | 113.0 | 4.0 | 31.5 | 14.9 | 5073.5 | 4.1 |
| 0.9 | 149.0 | 1.0 | 99.0 | 8.5 | 30.5 | 80.0 | 204.0 | 4.1 |
| 0.7 | 114.0 | 0.8 | 109.5 | 8.5 | 30.5 | 73.4 | 177.0 | 3.5 |
| 1.0 | 32.0 | <0.5 | 140.0 | 6.0 | 33.0 | 19.3 | 103.0 | 4.9 |
| 1.0 | 48.0 | 4.2 | 126.0 | 7.0 | 34.0 | 18.6 | 6502.5 | 5.2 |
| <0.5 | 597.0 | 2.5 | 41.0 | 41.0 | 2019.0 | 0.6 | 89.0 | 1.3 |
| <0.5 | 658.0 | 8.2 | 56.0 | 36.0 | 4378.5 | 1.8 | 103.0 | 1.1 |
| 1.0 | 371.0 | 2.8 | 478.5 | 16.0 | 378.0 | 29.0 | 379.5 | 9.4 |
| 0.9 | 238.5 | 1.1 | 274.5 | 10.0 | 110.0 | 27.6 | 441.0 | 7.4 |
| <0.5 | 201.0 | 8.7 | 117.5 | 9.0 | 15197.0 | 1.0 | 5809.5 | 2.3 |
| <0.5 | 874.5 | 6.0 | 50.5 | 45.0 | 3175.0 | 0.9 | 102.5 | 1.3 |
| 0.7 | 942.5 | 11.8 | 85.0 | 48.5 | 5379.5 | 1.4 | 184.0 | 1.8 |
| 0.7 | 366.0 | 1.3 | 144.5 | 16.5 | 576.0 | 8.7 | 182.0 | 2.6 |
| 0.9 | 274.0 | 1.1 | 265.5 | 5.0 | 85.5 | 19.5 | 292.0 | 5.7 |
| <0.5 | 191.0 | 18.7 | 289.0 | <2 | 31299.0 | 2.6 | 18174.5 | 4.4 |
| <0.5 | 54 | <0.5 | <1 | 3 | <1 | <0.5 | <5 | <0.1 |
| <0.5 | 65 | <0.5 | <1 | 5 | <1 | <0.5 | <5 | 0.1 |
| <0.5 | 51 | <0.5 | <1 | 9 | 2 | <0.5 | <5 | 0.1 |
| <0.5 | 33 | <0.5 | <1 | 13 | <1 | <0.5 | <5 | <0.1 |
| <0.5 | 22 | <0.5 | <1 | 8 | <1 | <0.5 | <5 | <0.1 |
| <0.5 | 51 | <0.5 | <1 | 8 | 1 | <0.5 | <5 | <0.1 |
| Na-pyrophosphate extraction | | | | | | | | |
| 136 | | 22 | 18645 | 2978 | | 1263 | 8920 | 829 |
| 97 | | <20 | 6912 | 1109 | | 430 | 3007 | 268 |
| 158 | | 24 | 17169 | 3898 | | 1388 | 5298 | 385 |
| 78 | | <20 | 5521 | 1025 | | 272 | 1486 | 120 |
| <5 | | <20 | 214 | 64 | | 77 | 492 | 26 |
| <5 | | <20 | 214 | 54 | | 63 | 451 | 18 |
| 10 | | <20 | 638 | 240 | | 125 | 752 | 22 |
| <5 | | <20 | 736 | 243 | | 116 | 33363 | 24 |
| <5 | | <20 | 209 | 71 | | 80 | 611 | 37 |
| <5 | | <20 | 306 | 64 | | 69 | 543 | 22 |
| <5 | | <20 | 858 | 246 | | 146 | 952 | 39 |
| <5 | | <20 | 1224 | 288 | | 203 | 52648 | 22 |
| I.S. | | I.S. | I.S. | I.S. | | I.S. | I.S. | I.S. |
| 27 | | 29 | 56791 | 2986 | | 41 | 6053 | 1055 |
| 16 | | <20 | 5530 | 648 | | 73 | 1714 | 114 |
| 7 | | <20 | 2393 | 424 | | 108 | 2455 | 47 |
| 22 | | <20 | 1238 | 14774 | | 59 | 6713 | 22 |
| 43 | | <20 | 49511 | 2295 | | 26 | 5935 | 931 |
| 48 | | 21 | 70068 | 3048 | | 42 | 6746 | 1258 |
| 29 | | <20 | 23622 | 2006 | | 70 | 3840 | 468 |
| 9 | | <20 | 1409 | 175 | | 45 | 1078 | 31 |
| 6 | | <20 | 1896 | 3180 | | 85 | 9711 | 34 |

| Er (ppb) | Eu (ppb) | Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) |
|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | |
| 30.6 | 17.8 | 366.9 | 78.8 | 19.9 | 49.1 | 3.5 | 11.0 | 1.0 |
| 8.0 | 3.8 | 129.9 | 18.3 | 7.1 | 16.9 | 2.0 | 2.7 | 0.3 |
| 5.8 | 2.7 | 149.8 | 11.7 | 7.5 | 16.5 | 1.0 | 2.0 | 0.4 |
| 2.1 | 1.0 | 71.5 | 4.3 | 3.4 | 7.2 | <1 | 0.8 | 0.1 |
| 2.5 | 0.9 | 45.6 | 3.3 | 3.6 | 5.7 | 1.0 | 0.9 | 0.2 |
| 2.2 | 0.8 | 40.1 | 4.0 | 2.9 | 4.6 | 1.0 | 0.8 | 0.1 |
| 1.7 | 0.8 | 26.2 | 4.8 | 1.3 | 1.2 | 1.0 | 0.6 | 0.1 |
| 2.1 | 1.0 | 25.3 | 5.6 | 1.2 | 1.0 | 2.0 | 0.7 | 0.1 |
| 2.4 | 0.8 | 43.3 | 3.8 | 3.5 | 5.7 | <1 | 0.8 | 0.2 |
| 1.9 | 0.7 | 39.1 | 3.4 | 2.7 | 4.6 | <1 | 0.7 | 0.1 |
| 2.7 | 1.5 | 34.4 | 6.0 | 1.7 | 1.5 | <1 | 0.9 | 0.1 |
| 2.9 | 1.6 | 32.3 | 7.8 | 1.3 | 1.5 | 2.0 | 1.0 | 0.2 |
| 0.4 | 0.5 | 3.5 | 1.8 | 3.0 | 0.4 | 4.0 | 0.2 | <0.05 |
| 0.5 | 0.3 | 7.1 | 1.7 | 3.3 | 0.8 | 3.0 | 0.2 | <0.05 |
| 4.4 | 3.3 | 71.4 | 15.9 | 4.2 | 9.8 | 2.0 | 1.5 | 0.2 |
| 4.0 | 2.5 | 61.4 | 9.5 | 4.5 | 11.2 | 1.0 | 1.3 | 0.2 |
| 1.1 | 0.4 | 2.4 | 3.1 | 4.4 | 0.4 | <1 | 0.4 | <0.05 |
| 0.7 | 0.4 | 4.8 | 2.5 | 5.3 | 0.4 | 2.0 | 0.2 | <0.05 |
| 1.0 | 0.4 | 7.8 | 2.6 | 4.7 | 0.8 | 2.0 | 0.4 | <0.05 |
| 1.6 | 1.0 | 23.3 | 4.8 | 2.2 | 3.5 | 1.0 | 0.5 | 0.1 |
| 2.9 | 2.1 | 45.2 | 8.9 | 2.9 | 7.3 | <1 | 1.3 | 0.1 |
| 2.0 | 1.0 | 5.6 | 4.8 | 6.7 | 0.4 | <1 | 0.8 | <0.05 |
| <0.1 | <0.1 | <0.5 | <0.1 | <0.1 | <0.1 | 1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.5 | 0.1 | <0.1 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.5 | <0.1 | <0.1 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.5 | <0.1 | <0.1 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.5 | <0.1 | 0.3 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.5 | <0.1 | <0.1 | <0.1 | 2 | <0.05 | <0.05 |
| Na-pyrophosphate extraction | | | | | | | | |
| 516 | 266 | 6245 | 1149 | 243 | 773 | 5 | 175 | <10 |
| 130 | 66 | 2354 | 255 | 83 | 281 | <5 | 41 | <10 |
| 244 | 117 | 6946 | 482 | 264 | 718 | <5 | 76 | 12 |
| 67 | 29 | 1633 | 124 | 63 | 178 | <5 | 26 | <10 |
| 12 | <5 | <50 | 48 | <50 | <20 | <5 | <20 | <10 |
| 15 | 5 | <50 | 33 | <50 | <20 | <5 | <20 | <10 |
| 15 | 10 | 457 | 46 | <50 | <20 | <5 | <20 | <10 |
| 7 | <5 | 360 | 36 | <50 | <20 | <5 | <20 | <10 |
| 11 | 8 | <50 | 55 | <50 | <20 | <5 | <20 | <10 |
| 18 | <5 | <50 | 56 | <50 | <20 | <5 | <20 | <10 |
| 16 | 12 | 488 | 41 | <50 | <20 | <5 | <20 | <10 |
| 21 | 10 | 564 | 59 | <50 | <20 | <5 | <20 | <10 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 556 | 470 | 374 | 1995 | <50 | 173 | 14 | 186 | <10 |
| 65 | 50 | 293 | 223 | <50 | 54 | <5 | <20 | <10 |
| 26 | 21 | 375 | 111 | <50 | 113 | <5 | <20 | <10 |
| 15 | 5 | 205 | 37 | <50 | 36 | <5 | <20 | <10 |
| 454 | 440 | 444 | 1722 | <50 | 152 | <5 | 174 | <10 |
| 624 | 581 | 479 | 2431 | <50 | 140 | <5 | 230 | <10 |
| 217 | 206 | 356 | 801 | <50 | 109 | <5 | 76 | <10 |
| 11 | 10 | 149 | 61 | <50 | 21 | <5 | <20 | <10 |
| 22 | 11 | 284 | 53 | <50 | 51 | <5 | <20 | <10 |

| La (ppb) | Li (ppb) | Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) |
|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | |
| 1216.0 | 1028.8 | 4.6 | 15.5 | 183.5 | 798.5 | 1087.5 | 412.5 | 224.3 |
| 229.5 | 363.1 | 1.3 | 12.5 | 58.0 | 171.0 | 350.0 | 127.0 | 45.3 |
| 176.0 | 377.8 | 0.9 | 19.5 | 58.7 | 122.0 | 400.0 | 142.5 | 32.8 |
| 64.0 | 180.2 | 0.3 | 7.0 | 33.4 | 42.0 | 166.5 | 92.5 | 12.0 |
| 36.0 | 310.0 | 0.4 | 8.0 | 14.0 | 27.0 | 39.5 | 45.0 | 10.9 |
| 34.0 | 276.9 | 0.3 | 8.0 | 12.1 | 26.5 | 37.0 | 40.0 | 8.0 |
| 40.0 | 71.5 | 0.2 | 8.0 | 4.1 | 32.0 | 17.5 | 107.5 | 7.6 |
| 48.5 | 56.5 | 0.2 | 73.5 | 4.1 | 31.0 | 20.5 | 102.0 | 8.5 |
| 34.5 | 278.7 | 0.4 | 10.5 | 14.4 | 24.0 | 38.5 | 45.0 | 9.2 |
| 56.0 | 253.3 | 0.6 | 7.5 | 13.1 | 23.5 | 36.0 | 37.5 | 6.0 |
| 62.5 | 88.8 | 0.4 | 8.5 | 6.1 | 45.0 | 24.0 | 115.5 | 11.7 |
| 58.5 | 76.1 | 0.4 | 61.5 | 5.0 | 46.5 | 25.5 | 97.0 | 11.6 |
| 32.0 | 12.9 | 0.1 | 27.0 | 1.5 | 17.0 | 84941.0 | 4.0 | 5.2 |
| 35.5 | 30.2 | 0.1 | 13.5 | 3.1 | 21.0 | 188944.0 | 5.0 | 5.8 |
| 235.0 | 195.5 | 0.7 | 13.0 | 44.7 | 163.5 | 10969.5 | 107.0 | 48.0 |
| 109.5 | 136.2 | 0.6 | 14.0 | 30.8 | 95.0 | 2566.5 | 99.5 | 25.0 |
| 59.0 | 23.9 | 0.1 | <1 | 1.2 | 26.0 | 489171.0 | 8.5 | 7.6 |
| 27.5 | 26.2 | 0.1 | 8.0 | 1.3 | 23.0 | 148546.5 | 4.5 | 6.1 |
| 58.0 | 46.9 | 0.2 | 34.0 | 3.1 | 32.5 | 254270.5 | 8.0 | 9.2 |
| 72.5 | 69.5 | 0.2 | 15.0 | 15.0 | 52.5 | 20778.0 | 35.5 | 14.8 |
| 109.0 | 126.0 | 0.6 | 8.5 | 31.3 | 87.0 | 2403.0 | 72.0 | 25.2 |
| 133.5 | 35.7 | 0.2 | 1.0 | 6.4 | 55.5 | 917423.0 | 8.5 | 18.5 |
| <2 | 4.3 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 |
| <2 | 0.8 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 |
| <2 | 2.1 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 |
| <2 | 3.2 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 |
| <2 | 24.4 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 |
| <2 | 0.5 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 |
| Na-pyrophosphate extraction | | | | | | | | |
| 24458 | 13388 | 72 | 75 | 1606 | 9810 | 11974 | 3373 | 2780 |
| 4961 | 4608 | 19 | 54 | 639 | 2281 | 4214 | 1418 | 626 |
| 9727 | 12671 | 34 | 106 | 1772 | 3968 | 11366 | 3726 | 1129 |
| 2497 | 2397 | 8 | 42 | 464 | 1108 | 2273 | 1216 | 306 |
| 346 | 270 | <5 | 16 | <10 | 231 | 56 | 95 | 54 |
| 339 | 244 | <5 | <10 | <10 | 191 | 62 | 65 | 45 |
| 766 | 923 | <5 | 14 | 18 | 288 | 176 | 746 | 82 |
| 571 | 551 | <5 | 147 | 15 | 249 | 242 | 689 | 63 |
| 336 | 195 | <5 | <10 | <10 | 160 | 60 | 78 | 44 |
| 332 | 196 | <5 | <10 | <10 | 219 | <50 | 69 | 48 |
| 802 | 848 | <5 | 20 | 22 | 356 | 208 | 686 | 82 |
| 942 | 1059 | <5 | 141 | 32 | 363 | 330 | 806 | 81 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 57944 | 280 | 63 | 284 | 347 | 22356 | 248439 | 1539 | 6449 |
| 4760 | 369 | <5 | 99 | 175 | 2078 | 19745 | 426 | 566 |
| 1740 | 571 | <5 | 133 | 130 | 961 | 8869 | 570 | 235 |
| 812 | 251 | <5 | 57 | 106 | 406 | 419062 | 294 | 105 |
| 45894 | 168 | 58 | 291 | 353 | 20109 | 230301 | 1407 | 5813 |
| 87467 | 253 | 64 | 390 | 405 | 27167 | 272557 | 1764 | 8117 |
| 23363 | 382 | 28 | 203 | 262 | 8592 | 94891 | 886 | 2585 |
| 1136 | 291 | <5 | 41 | 79 | 519 | 6790 | 241 | 139 |
| 1241 | 534 | <5 | 65 | 155 | 579 | 95084 | 445 | 161 |

| Rb (ppb) | Re (ppb) | S (ppm) | Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) |
|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | |
| 1945.5 | <0.05 | 108.5 | 19.0 | 1021.5 | 27.0 | 127.2 | 39.0 | 1209.0 |
| 810.5 | <0.05 | 336.0 | 27.0 | 317.0 | 15.5 | 28.0 | 13.5 | 591.0 |
| 991.5 | <0.05 | 156.0 | 11.5 | 345.0 | 15.5 | 19.4 | 15.0 | 522.5 |
| 502.5 | <0.05 | 105.5 | 2.5 | 156.0 | 7.0 | 7.2 | 7.5 | 266.0 |
| 276.0 | <0.05 | <10 | 6.5 | 151.5 | <5 | 5.2 | 5.0 | 735.0 |
| 239.0 | <0.05 | <10 | 5.5 | 135.0 | <5 | 5.7 | 5.5 | 651.0 |
| 150.0 | <0.05 | <10 | 2.0 | 101.5 | <5 | 5.7 | 2.0 | 490.5 |
| 184.0 | <0.05 | <10 | 5.5 | 88.0 | <5 | 17.5 | 2.5 | 341.5 |
| 256.5 | <0.05 | <10 | 6.0 | 141.5 | <5 | 5.7 | 5.0 | 840.0 |
| 228.5 | <0.05 | <10 | 5.5 | 131.0 | <5 | 4.6 | 4.0 | 816.0 |
| 145.5 | <0.05 | <10 | 2.5 | 124.5 | <5 | 8.5 | 3.5 | 897.0 |
| 204.0 | <0.05 | <10 | 5.5 | 116.5 | <5 | 9.0 | 3.0 | 410.0 |
| 43.0 | 0.1 | 709.0 | 4.0 | <20 | 7.0 | 2.9 | <1 | 565.0 |
| 82.0 | 0.1 | 966.0 | 3.0 | <20 | 16.5 | 2.7 | <1 | 767.0 |
| 543.5 | <0.05 | 82.5 | 2.0 | 158.0 | 6.0 | 24.1 | 5.5 | 200.0 |
| 431.5 | <0.05 | 27.5 | 2.5 | 142.5 | 6.0 | 15.5 | 4.5 | 98.0 |
| 62.0 | 0.4 | 797.5 | <1 | <20 | 40.5 | 4.0 | <1 | 172.5 |
| 54.0 | 0.1 | 859.0 | 2.5 | <20 | 9.0 | 2.8 | <1 | 907.5 |
| 97.0 | 0.1 | 1441.5 | 6.0 | 26.0 | 34.5 | 4.9 | <1 | 1466.0 |
| 184.0 | <0.05 | 271.5 | 3.5 | 57.5 | 14.5 | 8.0 | 2.0 | 180.5 |
| 348.0 | <0.05 | 21.5 | 2.0 | 104.0 | <5 | 15.0 | 4.5 | 100.0 |
| 94.5 | 0.6 | 1182.5 | <1 | <20 | 115.5 | 7.1 | <1 | 86.5 |
| 3 | <0.05 | <10 | 3 | <20 | <5 | <0.5 | <1 | 79 |
| <2 | <0.05 | <10 | 2 | <20 | 5 | <0.5 | <1 | 64 |
| <2 | <0.05 | <10 | 2 | <20 | 6 | <0.5 | <1 | 73 |
| 2 | <0.05 | <10 | 2 | <20 | <5 | <0.5 | <1 | 64 |
| 2 | 0.06 | <10 | 2 | <20 | <5 | <0.5 | <1 | 67 |
| 2 | <0.05 | <10 | 3 | <20 | <5 | <0.5 | <1 | 69 |
| Na-pyrophosphate extraction | | | | | | | | |
| 21010 | <2 | | 110 | 13484 | <200 | 1523 | 477 | 6803 |
| 8508 | <2 | | 144 | 4771 | <200 | 395 | 178 | 2093 |
| 26239 | <2 | | 135 | 13663 | <200 | 644 | 506 | 5577 |
| 5803 | <2 | | 14 | 2894 | <200 | 144 | 126 | 1120 |
| 244 | <2 | | <5 | 173 | <200 | 46 | <20 | 924 |
| 211 | <2 | | <5 | 159 | <200 | 37 | <20 | 861 |
| 747 | <2 | | <5 | 1615 | <200 | 43 | 26 | 323 |
| 705 | <2 | | 18 | 1239 | <200 | 41 | 25 | 274 |
| 227 | <2 | | <5 | 212 | <200 | 45 | <20 | 974 |
| 189 | <2 | | 14 | 174 | <200 | 51 | <20 | 953 |
| 756 | <2 | | <5 | 1881 | <200 | 97 | 35 | 420 |
| 1180 | <2 | | 24 | 2079 | <200 | 95 | 44 | 458 |
| I.S. | I.S. | | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 708 | <2 | | 16 | 1482 | <200 | 2847 | 61 | 945 |
| 1159 | <2 | | <5 | 703 | <200 | 316 | 29 | 248 |
| 1604 | <2 | | <5 | 1085 | <200 | 182 | 23 | 226 |
| 844 | <2 | | <5 | 442 | 577 | 58 | 27 | 116 |
| 379 | <2 | | 8 | 1346 | <200 | 2996 | 51 | 904 |
| 626 | <2 | | 12 | 1454 | 301 | 3476 | 54 | 1196 |
| 1087 | <2 | | 11 | 1057 | 335 | 1133 | 40 | 378 |
| 730 | <2 | | <5 | 343 | <200 | 89 | <20 | 136 |
| 1306 | <2 | | <5 | 664 | 247 | 88 | 21 | 147 |

| Ta (ppb) | Tb (ppb) | Te (ppb) | Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) |
|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | |
| 17.9 | 11.0 | <1 | 351.0 | 46.6 | 4.4 | 29.7 | 2286.0 | 16.0 |
| 5.6 | 2.5 | 1.0 | 109.5 | 15.2 | 1.1 | 13.3 | 773.5 | 6.5 |
| 5.8 | 1.8 | <1 | 101.0 | 16.3 | 0.9 | 9.8 | 1011.0 | 6.5 |
| 3.2 | 0.7 | <1 | 44.5 | 8.9 | 0.3 | 4.8 | 593.0 | 4.0 |
| 1.1 | 0.6 | <1 | 16.0 | 4.9 | 0.4 | 6.2 | 218.5 | 4.0 |
| 1.1 | 1.0 | <1 | 14.0 | 4.2 | 0.3 | 6.4 | 218.0 | 3.5 |
| <0.5 | 0.5 | <1 | 18.5 | 1.5 | 0.2 | 1.7 | 112.0 | 4.0 |
| <0.5 | 1.1 | <1 | 16.5 | 1.3 | 0.3 | 2.1 | 104.5 | 6.0 |
| 1.2 | 0.6 | <1 | 22.5 | 4.7 | 0.3 | 6.2 | 204.5 | 3.0 |
| 1.0 | 0.6 | <1 | 15.0 | 3.9 | 0.3 | 4.9 | 188.5 | 2.5 |
| <0.5 | 0.8 | <1 | 20.0 | 2.0 | 0.3 | 2.3 | 157.5 | 5.5 |
| 0.5 | 1.0 | <1 | 20.0 | 1.9 | 0.3 | 2.6 | 126.0 | 6.0 |
| <0.5 | 0.3 | <1 | 4.0 | 0.4 | 0.1 | 2.0 | 101.0 | <2 |
| <0.5 | 0.2 | 1.0 | 6.0 | 0.8 | 0.1 | 1.6 | 77.0 | <2 |
| 4.0 | 1.8 | 1.0 | 91.0 | 12.6 | 0.6 | 17.1 | 423.5 | 3.0 |
| 2.5 | 1.4 | <1 | 61.5 | 10.8 | 0.6 | 13.6 | 415.0 | 2.0 |
| <0.5 | 0.4 | <1 | 2.0 | 0.3 | 0.1 | 8.7 | <50 | <2 |
| <0.5 | 0.3 | <1 | 4.5 | 0.4 | 0.2 | 1.9 | 53.0 | <2 |
| <0.5 | 0.4 | <1 | 6.5 | 0.7 | 0.1 | 2.1 | 158.0 | <2 |
| 1.4 | 0.6 | <1 | 33.5 | 3.9 | 0.2 | 6.3 | 194.5 | <2 |
| 2.7 | 1.1 | <1 | 55.0 | 8.8 | 0.4 | 11.0 | 291.5 | <2 |
| <0.5 | 0.9 | <1 | 3.5 | 0.9 | 0.3 | 17.0 | <50 | <2 |
| <0.5 | <0.05 | <1 | <2 | <0.05 | <0.05 | 1.7 | <50 | <2 |
| <0.5 | <0.05 | <1 | <2 | <0.05 | <0.05 | 0.5 | <50 | <2 |
| <0.5 | <0.05 | <1 | <2 | <0.05 | <0.05 | 0.2 | <50 | <2 |
| <0.5 | <0.05 | <1 | <2 | <0.05 | <0.05 | 0.4 | <50 | <2 |
| <0.5 | <0.05 | <1 | <2 | <0.05 | <0.05 | 0.7 | <50 | <2 |
| <0.5 | <0.05 | <1 | <2 | <0.05 | <0.05 | 0.1 | <50 | <2 |
| Na-pyrophosphate extraction | | | | | | | | |
| 161 | 169 | <20 | 13566 | 258 | 69 | 327 | 24691 | 152 |
| 59 | 40 | <20 | 5717 | 101 | 20 | 144 | 10884 | 83 |
| 183 | 71 | <20 | 13736 | 303 | 31 | 300 | 29253 | 205 |
| 37 | 21 | <20 | 4349 | 76 | 7 | 83 | 9385 | 51 |
| <20 | <5 | <20 | 142 | 2 | <5 | 8 | 244 | <10 |
| <20 | <5 | <20 | 159 | 3 | <5 | 8 | 155 | <10 |
| <20 | <5 | <20 | 331 | 4 | <5 | 10 | 777 | 22 |
| <20 | <5 | <20 | 303 | 1 | <5 | 12 | 633 | 24 |
| <20 | <5 | <20 | 141 | <1 | <5 | 8 | 201 | <10 |
| <20 | <5 | <20 | 161 | <1 | <5 | 7 | 220 | <10 |
| <20 | <5 | <20 | 431 | 1 | <5 | 13 | 946 | 21 |
| <20 | 13 | <20 | 509 | 7 | <5 | 20 | 1014 | 41 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 32 | 249 | <20 | 10627 | 59 | 68 | 613 | 4394 | <10 |
| <20 | 22 | <20 | 2436 | 21 | 5 | 154 | 1659 | <10 |
| <20 | 10 | <20 | 1692 | 25 | <5 | 137 | 2050 | <10 |
| <20 | <5 | 21 | 1181 | 14 | <5 | 65 | 990 | 14 |
| 22 | 212 | 41 | 10335 | 65 | 66 | 612 | 3906 | 17 |
| 26 | 293 | <20 | 11221 | 60 | 77 | 647 | 5239 | 27 |
| 24 | 86 | <20 | 5912 | 41 | 23 | 311 | 3312 | <10 |
| <20 | <5 | <20 | 846 | 13 | <5 | 57 | 877 | <10 |
| <20 | 7 | <20 | 1704 | 21 | <5 | 73 | 1429 | <10 |

| Y (ppb) | Yb (ppb) | Zn (ppb) | Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) |
|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | |
| 419.5 | 36.4 | 2062.5 | 2149.0 | 343.0 | 951.4 | 411.0 | 317.3 | 11490.5 |
| 89.0 | 8.9 | 759.0 | 650.0 | 310.0 | 319.1 | 215.5 | 218.0 | 6273.5 |
| 64.0 | 7.2 | 864.0 | 664.5 | 167.0 | 352.5 | 207.5 | 131.5 | 9072.0 |
| 25.0 | 2.7 | 567.5 | 290.5 | 147.5 | 181.2 | 123.5 | 90.2 | 7755.5 |
| 27.5 | 2.9 | 340.0 | 210.5 | 125.0 | 79.3 | 175.0 | 60.8 | 1898.5 |
| 31.5 | 2.5 | 287.5 | 187.0 | 121.5 | 70.0 | 168.5 | 52.3 | 1595.0 |
| 21.0 | 2.1 | 209.0 | 47.5 | 106.5 | 58.3 | 58.5 | 32.1 | 2631.0 |
| 27.0 | 2.1 | 616.5 | 51.5 | 80.0 | 52.6 | 60.5 | 33.3 | 2837.5 |
| 26.0 | 2.6 | 323.0 | 201.0 | 128.5 | 76.3 | 151.0 | 59.4 | 1915.0 |
| 23.5 | 2.4 | 284.0 | 180.0 | 123.0 | 66.7 | 151.5 | 54.8 | 1902.0 |
| 33.0 | 2.5 | 258.0 | 75.0 | 127.0 | 75.7 | 71.0 | 42.4 | 2121.5 |
| 35.5 | 3.5 | 697.5 | 62.0 | 95.0 | 66.5 | 71.5 | 43.1 | 2744.0 |
| 8.0 | 0.9 | 111.0 | 17.0 | 166.0 | 10.0 | 110.0 | 220.0 | 32472.0 |
| 9.5 | 0.7 | 509.5 | 31.5 | 276.0 | 14.1 | 125.0 | 285.0 | 56122.5 |
| 52.0 | 5.2 | 958.0 | 367.5 | 21.5 | 261.9 | 76.0 | 78.5 | 6602.0 |
| 44.0 | 4.0 | 861.0 | 436.0 | 9.5 | 268.6 | 64.5 | 59.4 | 2206.5 |
| 14.0 | 0.8 | 394.5 | 68.5 | 64.0 | 145.4 | 35.5 | 199.9 | 5784.5 |
| 7.5 | 0.5 | 324.0 | 18.5 | 340.5 | 13.4 | 135.5 | 189.2 | 50678.5 |
| 15.5 | 1.1 | 716.5 | 33.0 | 436.5 | 15.1 | 148.0 | 323.6 | 95041.5 |
| 18.0 | 1.9 | 329.5 | 128.0 | 72.5 | 77.7 | 76.5 | 103.6 | 12073.0 |
| 40.5 | 3.6 | 583.5 | 296.5 | 10.0 | 190.0 | 46.5 | 46.1 | 1877.0 |
| 31.5 | 1.9 | 1271.0 | 17.5 | 32.5 | 227.8 | 33.5 | 352.7 | 5747.0 |
| <1 | <0.5 | 35 | <1 | 165 | 0.3 | 5 | 71.7 | 135 |
| <1 | <0.5 | 29 | <1 | 147 | <0.1 | 5 | 56 | 73 |
| <1 | <0.5 | 696 | <1 | 163 | 0.2 | 5 | 63.4 | 560 |
| <1 | <0.5 | 201 | <1 | 149 | <0.1 | 6 | 57 | 178 |
| <1 | <0.5 | 45 | <1 | 152 | <0.1 | 5 | 53.6 | 76 |
| <1 | <0.5 | 833 | <1 | 165 | 0.2 | 4 | 68.9 | 656 |
| Na-pyrophosphate extraction | | | | | | | | |
| 5674 | 539 | 17539 | 23786 | 755 | 8681 | 3650 | 2641 | 91801 |
| 1272 | 142 | 6701 | 8981 | 509 | 3603 | 1206 | 1067 | 39626 |
| 2291 | 228 | 20094 | 21905 | 247 | 9183 | 3528 | 2299 | 105723 |
| 582 | 65 | 5628 | 5389 | 284 | 2773 | 684 | 571 | 45539 |
| 217 | 15 | 504 | 259 | 132 | 60 | 77 | 48 | 5349 |
| 198 | 6 | 446 | 233 | 135 | 52 | 69 | 46 | 4744 |
| 179 | <5 | 1360 | 404 | 53 | 479 | 127 | 262 | 18109 |
| 143 | 12 | 4040 | 318 | 28 | 376 | 117 | 203 | 10552 |
| 208 | <5 | 528 | 796 | 131 | 60 | 71 | 53 | 5910 |
| 212 | <5 | 426 | 438 | 138 | 50 | 68 | 42 | 6493 |
| 197 | 10 | 1651 | 433 | 58 | 556 | 147 | 310 | 13390 |
| 252 | 14 | 4480 | 487 | 39 | 625 | 193 | 324 | 17177 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 6225 | 479 | 1511 | 5338 | 158 | 1863 | 71 | 83 | 16831 |
| 623 | 68 | 1893 | 2008 | 12 | 789 | 136 | 109 | 8410 |
| 369 | 43 | 2669 | 2718 | 10 | 1219 | 200 | 164 | 6847 |
| 125 | 19 | 1042 | 1156 | 7 | 1004 | 97 | 146 | 3658 |
| 5200 | 454 | 1230 | 4768 | 201 | 2452 | 33 | 49 | 14797 |
| 7680 | 508 | 1731 | 5619 | 206 | 1932 | 66 | 73 | 21889 |
| 2508 | 209 | 1905 | 3677 | 60 | 1112 | 133 | 108 | 10288 |
| 139 | 10 | 1020 | 1046 | <5 | 490 | 83 | 72 | 3228 |
| 185 | 14 | 1698 | 1670 | <5 | 1241 | 153 | 167 | 4959 |

| Na (ppm) | P (ppm) | Tl (ppb) |
|---|---|---|
| Deionized water extraction | | |
| 83.5 | 11.4 | 8.9 |
| 40.5 | 3.4 | 3.5 |
| 61.0 | 5.0 | 3.8 |
| 30.5 | 3.5 | 1.6 |
| 38.0 | 2.5 | 1.3 |
| 37.0 | 2.7 | 1.2 |
| 15.5 | 0.8 | 0.6 |
| 14.0 | 1.3 | 0.9 |
| 37.0 | 2.3 | 1.3 |
| 38.5 | 3.5 | 1.1 |
| 19.0 | 0.9 | 0.8 |
| 20.0 | 1.5 | 1.0 |
| 82.0 | 2.2 | 1.2 |
| 87.0 | 2.1 | 1.3 |
| 29.0 | 4.2 | 3.7 |
| 28.5 | 5.2 | 2.9 |
| 19.5 | 0.2 | 0.7 |
| 106.5 | 3.2 | 1.9 |
| 95.0 | 3.3 | 1.3 |
| 46.5 | 3.0 | 1.3 |
| 22.5 | 3.1 | 2.4 |
| 16.5 | 0.2 | 0.9 |
| <3 | <0.1 | 0.3 |
| 4 | <0.1 | <0.2 |
| 4 | <0.1 | <0.2 |
| 6 | <0.1 | <0.2 |
| 3 | <0.1 | <0.2 |
| <3 | <0.1 | <0.2 |
| | | |
| Na-pyrophosphate extraction | | |
| | | 103 |
| | | 38 |
| | | 114 |
| | | 25 |
| | | <5 |
| | | <5 |
| | | <5 |
| | | <5 |
| | | <5 |
| | | <5 |
| | | <5 |
| | | 8 |
| | | I.S. |
| | | 9 |
| | | 9 |
| | | 13 |
| | | 7 |
| | | 7 |
| | | 7 |
| | | 9 |
| | | <5 |
| | | 12 |

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) | Ba (ppb) | Be (ppb) |
|---|---|---|---|---|---|---|
| Na-acetate Extraction | | | | | | |
| Talbot/T7 A Soil Top | <3 | 137 | 338 | 16 | 56172 | 69 |
| Talbot/T7 A Soil Bottom | <3 | 140 | 458 | 15 | 34615 | 39 |
| Talbot/T7 B Soil Top | <3 | 206 | 300 | 14 | 52044 | 83 |
| Talbot/T7 B Soil Bottom | <3 | 92 | 168 | 8 | 18705 | 34 |
| Arrieros/LB A Soil Top | <3 | 92 | 2782 | 2 | 15988 | <20 |
| Arrieros/LB A Soil Bottom | <3 | 90 | 2744 | <1 | 14387 | <20 |
| Arrieros/LB A Grav Top | <3 | 29 | <100 | 1 | 5061 | <20 |
| Arrieros/LB A Grav Bottom | <3 | 29 | 391 | 7 | 10172 | 33 |
| Arrieros/LB B Soil Top | <3 | 86 | 2786 | <1 | 13661 | <20 |
| Arrieros/LB B Soil Bottom | <3 | 88 | 2671 | <1 | 14932 | <20 |
| Arrieros/LB B Grav Top | <3 | 24 | <100 | 2 | 6218 | <20 |
| Arrieros/LB B Grav Bottom | <3 | 31 | 517 | 4 | 14102 | 51 |
| Raglan A Soil Top | <3 | 244 | <100 | 9 | 26299 | 115 |
| Raglan A Soil Bottom | <3 | 206 | <100 | 6 | 30369 | 63 |
| Raglan A Till Top | <3 | 38 | <100 | <1 | 12748 | 41 |
| Raglan A Till Middle | <3 | 35 | 139 | 4 | 17093 | 50 |
| Raglan A Till Bottom | <3 | 32 | 166 | 5 | 6027 | 33 |
| Raglan B Soil Top | <3 | 230 | 115 | 9 | 26180 | 31 |
| Raglan B Soil Bottom | <3 | 196 | 241 | 9 | 30430 | 88 |
| Raglan B Till Top | <3 | 80 | 107 | 5 | 16003 | <20 |
| Raglan B Till Middle | <3 | 42 | <100 | 1 | 12531 | 33 |
| Raglan B Till Bottom | <3 | 28 | <100 | 5 | 6574 | <20 |
| Talbot/T7 A Carb Top | <3 | 8 | 105 | 11 | 925 | <20 |
| Talbot/T7 A Carb Middle | <3 | 7 | 146 | <1 | 685 | <20 |
| Talbot/T7 A Carb Bottom | <3 | 7 | 112 | <1 | 595 | <20 |
| Talbot/T7 B Carb Top | <3 | 8 | 106 | <1 | 846 | <20 |
| Talbot/T7 B Carb Middle | <3 | 6 | 264 | <1 | 707 | <20 |
| Talbot/T7 B Carb Bottom | <3 | 12 | 206 | 2 | 541 | 44 |
| | | | | | | |
| 0.1M Hydroxylamine-HCl Extraction | | | | | | |
| Talbot/T7 A Soil Top | 5 | 45 | 132 | <1 | 5148 | 20 |
| Talbot/T7 A Soil Bottom | <3 | 11 | <100 | 5 | 4568 | <20 |
| Talbot/T7 B Soil Top | 14 | 1546 | 115 | <1 | 12052 | 142 |
| Talbot/T7 B Soil Bottom | 9 | 894 | <100 | 2 | 11648 | 81 |
| Arrieros/LB A Soil Top | 12 | 1042 | 3477 | <1 | 30316 | 142 |
| Arrieros/LB A Soil Bottom | 11 | 1019 | 3169 | <1 | 27930 | 121 |
| Arrieros/LB A Grav Top | 6 | 263 | 1019 | <1 | 14016 | 40 |
| Arrieros/LB A Grav Bottom | <3 | 278 | 1060 | <1 | 28860 | 40 |
| Arrieros/LB B Soil Top | 10 | 967 | 3442 | <1 | 33579 | 120 |
| Arrieros/LB B Soil Bottom | 12 | 1064 | 3560 | <1 | 33404 | 121 |
| Arrieros/LB B Grav Top | 4 | 275 | 756 | <1 | 16805 | 40 |
| Arrieros/LB B Grav Bottom | <3 | 265 | 1260 | <1 | 13383 | 40 |
| Raglan A Soil Top | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| Raglan A Soil Bottom | 17 | 1793 | 183 | <1 | 26711 | 118 |
| Raglan A Till Top | 21 | 993 | 245 | <1 | 6941 | 60 |
| Raglan A Till Middle | 6 | 1249 | <100 | <1 | 6056 | 60 |
| Raglan A Till Bottom | <3 | 693 | <100 | <1 | 4372 | 40 |
| Raglan B Soil Top | 25 | 1578 | 232 | <1 | 28857 | 40 |
| Raglan B Soil Bottom | 10 | 1910 | 335 | <1 | 26391 | 79 |
| Raglan B Till Top | 4 | 1163 | 172 | <1 | 20134 | <20 |
| Raglan B Till Middle | 8 | 718 | <100 | <1 | 2678 | 60 |
| Raglan B Till Bottom | <3 | 739 | <100 | <1 | 4859 | <20 |

| Bi (ppb) | Cd (ppb) | Ce (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) | Dy (ppb) | Er (ppb) | Eu (ppb) |
|---|---|---|---|---|---|---|---|---|
| Na-acetate Extraction | | | | | | | | |
| 34 | <20 | 12266 | 311 | 6 | 2283 | 609 | 280 | 219 |
| 22 | <20 | 7993 | 891 | 7 | 1135 | 240 | 115 | 76 |
| 28 | <20 | 8083 | 885 | 21 | 881 | 162 | 83 | 55 |
| 17 | <20 | 2216 | 764 | 9 | 224 | 51 | 19 | 17 |
| <5 | 68 | 557 | 97 | 124 | 277 | 124 | 65 | 31 |
| <5 | 70 | 517 | 81 | 118 | 220 | 102 | 55 | 27 |
| <5 | 28 | 373 | 148 | 6 | 94 | 136 | 60 | 40 |
| <5 | 159 | 536 | 415 | 18 | 153268 | 115 | 62 | 39 |
| <5 | 66 | 557 | 107 | 109 | 663 | 110 | 57 | 30 |
| <5 | 65 | 565 | 119 | 110 | 381 | 111 | 52 | 29 |
| <5 | 31 | 568 | 201 | 7 | 173 | 164 | 81 | 53 |
| <5 | 172 | 537 | 375 | 18 | 228421 | 162 | 80 | 50 |
| 10 | 65 | 17362 | 10816 | <5 | 1923 | 442 | 170 | 214 |
| 9 | 139 | 26257 | 14338 | 6 | 2040 | 649 | 256 | 289 |
| <5 | 34 | 7710 | 2163 | <5 | 631 | 181 | 77 | 81 |
| <5 | <20 | 5332 | 558 | <5 | 846 | 147 | 70 | 62 |
| 9 | <20 | 3689 | 5689 | 18 | 11019 | 69 | 34 | 30 |
| <5 | 94 | 18493 | 10684 | <5 | 1651 | 458 | 185 | 218 |
| 26 | 164 | 31276 | 14583 | <5 | 2290 | 679 | 283 | 320 |
| 11 | 49 | 14060 | 3947 | <5 | 1082 | 318 | 132 | 141 |
| 5 | <20 | 5253 | 622 | <5 | 484 | 131 | 67 | 56 |
| 7 | <20 | 3610 | 7488 | 16 | 15847 | 63 | 34 | 29 |
| <5 | <20 | 182 | 88 | <5 | 92 | 10 | 6 | <5 |
| <5 | <20 | 176 | 116 | <5 | 122 | 7 | <5 | <5 |
| <5 | <20 | 178 | 199 | <5 | 159 | 5 | <5 | <5 |
| <5 | <20 | 205 | 178 | <5 | 232 | 10 | <5 | <5 |
| <5 | <20 | 174 | 138 | <5 | 125 | <5 | <5 | <5 |
| <5 | <20 | 180 | 120 | <5 | 287 | 5 | <5 | <5 |
| 0.1M Hydroxylamine-HCl Extraction | | | | | | | | |
| <5 | <20 | 332 | 1819 | <5 | 58 | 8 | 6 | <5 |
| <5 | <20 | 36 | 747 | <5 | <20 | <5 | <5 | <5 |
| <5 | <20 | 4364 | 5415 | 18 | 1654 | 103 | 49 | 26 |
| <5 | 32 | 3402 | 3508 | 11 | 628 | 42 | 19 | 13 |
| <5 | 60 | 8165 | 2840 | 54 | 4090 | 476 | 244 | 107 |
| <5 | 63 | 7994 | 2460 | 55 | 3995 | 427 | 214 | 102 |
| <5 | 25 | 4113 | 1284 | 20 | 870 | 172 | 86 | 46 |
| <5 | 103 | 5958 | 2116 | 36 | 67718 | 211 | 108 | 58 |
| <5 | 70 | 7969 | 2707 | 50 | 4599 | 442 | 220 | 98 |
| <5 | 60 | 9029 | 2924 | 31 | 4560 | 474 | 220 | 99 |
| <5 | <20 | 3461 | 1001 | 23 | 1117 | 191 | 84 | 45 |
| <5 | 81 | 4078 | 1168 | 26 | 66331 | 209 | 100 | 53 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| <5 | 44 | 6998 | 15212 | 91 | 2198 | 145 | 80 | 39 |
| <5 | 59 | 10771 | 5356 | 30 | 4008 | 272 | 133 | 108 |
| <5 | 50 | 8536 | 2423 | 27 | 8652 | 269 | 147 | 102 |
| <5 | <20 | 4457 | 11192 | 53 | 32248 | 147 | 66 | 51 |
| 10 | 39 | 6383 | 11235 | 77 | 1630 | 133 | 68 | 40 |
| <5 | 50 | 8725 | 16480 | 101 | 2597 | 156 | 77 | 69 |
| <5 | 83 | 6505 | 11612 | 34 | 2713 | 183 | 78 | 62 |
| <5 | 26 | 7496 | 947 | 19 | 2780 | 245 | 124 | 94 |
| <5 | 25 | 4999 | 9967 | 49 | 39102 | 146 | 69 | 50 |

| Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) | La (ppb) | Li (ppb) |
|---|---|---|---|---|---|---|---|---|
| Na-acetate Extraction | | | | | | | | |
| 62 | 1056 | <50 | <20 | <5 | 108 | <10 | 12051 | 273 |
| 29 | 394 | <50 | <20 | 33 | 46 | <10 | 3201 | 230 |
| <20 | 306 | <50 | <20 | 8 | 31 | <10 | 2415 | 187 |
| <20 | 92 | <50 | <20 | 7 | <20 | <10 | 609 | 50 |
| <20 | 163 | <50 | <20 | <5 | 23 | <10 | 957 | 141 |
| <20 | 146 | <50 | <20 | <5 | 22 | <10 | 844 | 162 |
| <20 | 210 | <50 | <20 | <5 | 25 | <10 | 979 | 38 |
| <20 | 195 | <50 | <20 | <5 | 25 | <10 | 876 | 39 |
| <20 | 148 | <50 | <20 | <5 | 23 | <10 | 873 | 151 |
| <20 | 156 | <50 | <20 | <5 | 23 | <10 | 861 | 140 |
| <20 | 229 | <50 | <20 | 6 | 31 | <10 | 1179 | 77 |
| <20 | 252 | <50 | <20 | 5 | 32 | <10 | 1168 | <20 |
| 51 | 1036 | <50 | <20 | 37 | 77 | <10 | 10819 | 68 |
| 64 | 1453 | <50 | <20 | 16 | 102 | <10 | 19860 | 67 |
| <20 | 384 | <50 | <20 | 14 | 27 | <10 | 4914 | 46 |
| <20 | 288 | <50 | <20 | 7 | 27 | <10 | 2288 | 23 |
| <20 | 136 | <50 | <20 | 6 | <20 | <10 | 1603 | 23 |
| 68 | 1062 | <50 | <20 | 34 | 74 | <10 | 12540 | 33 |
| 105 | 1657 | <50 | <20 | 26 | 111 | <10 | 28626 | 56 |
| 36 | 788 | <50 | <20 | 9 | 53 | <10 | 10155 | 28 |
| <20 | 273 | <50 | <20 | 8 | 33 | <10 | 2286 | 22 |
| <20 | 138 | <50 | <20 | 10 | <20 | <10 | 1526 | <20 |
| <20 | <5 | <50 | <20 | <5 | <20 | <10 | 75 | 180 |
| <20 | 12 | <50 | <20 | <5 | <20 | <10 | 74 | 146 |
| <20 | 17 | <50 | <20 | <5 | <20 | <10 | 72 | 112 |
| <20 | 6 | <50 | <20 | <5 | <20 | <10 | 98 | 119 |
| <20 | 9 | <50 | <20 | 13 | <20 | <10 | 76 | 148 |
| <20 | 17 | <50 | <20 | 10 | <20 | <10 | 75 | 141 |
| 0.1M Hydroxylamine-HCl Extraction | | | | | | | | |
| <20 | 25 | <50 | <20 | 23 | <20 | <10 | 433 | 320 |
| <20 | <5 | <50 | <20 | 21 | <20 | <10 | 22 | 257 |
| <20 | 154 | <50 | <20 | <5 | 21 | <10 | 1494 | 2051 |
| 21 | 71 | <50 | <20 | <5 | <20 | <10 | 880 | 969 |
| 24 | 686 | <50 | <20 | <5 | 98 | <10 | 3552 | 3978 |
| 21 | 632 | <50 | <20 | <5 | 79 | <10 | 3327 | 4338 |
| <20 | 254 | <50 | <20 | <5 | 35 | <10 | 1338 | 984 |
| 26 | 328 | <50 | <20 | <5 | 45 | <10 | 1502 | 964 |
| 35 | 654 | <50 | <20 | <5 | 77 | <10 | 3362 | 3824 |
| 28 | 665 | <50 | <20 | <5 | 84 | <10 | 3609 | 3827 |
| 21 | 255 | <50 | <20 | <5 | 33 | <10 | 1341 | 1120 |
| 21 | 280 | <50 | <20 | <5 | 41 | <10 | 1304 | 869 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 84 | 281 | <50 | <20 | 20 | 29 | <10 | 6437 | 3098 |
| 35 | 486 | <50 | <20 | <5 | 52 | <10 | 6357 | 1870 |
| 39 | 432 | <50 | <20 | <5 | 54 | <10 | 4224 | 2026 |
| 57 | 224 | <50 | <20 | <5 | 26 | <10 | 2166 | 1047 |
| 99 | 237 | <50 | <20 | <5 | 27 | <10 | 5774 | 2144 |
| 142 | 354 | <50 | <20 | <5 | 40 | <10 | 9347 | 3100 |
| 31 | 306 | <50 | <20 | <5 | 34 | <10 | 4941 | 1984 |
| 52 | 395 | <50 | <20 | <5 | 44 | <10 | 3778 | 1323 |
| 31 | 235 | <50 | <20 | <5 | 25 | <10 | 2519 | 1204 |

| Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) | Rb (ppb) | Re (ppb) |
|---|---|---|---|---|---|---|---|---|
| Na-acetate Extraction | | | | | | | | |
| 36 | 10 | <10 | 8169 | 968 | 1897 | 2016 | 323 | <2 |
| 14 | <10 | <10 | 2588 | 632 | 1221 | 651 | 462 | <2 |
| 9 | <10 | <10 | 1708 | 553 | 1844 | 428 | 1520 | <2 |
| <5 | <10 | <10 | 442 | 203 | 862 | 110 | 625 | <2 |
| 8 | <10 | <10 | 899 | 89 | 111 | 204 | 569 | <2 |
| 7 | <10 | <10 | 768 | 90 | 86 | 181 | 531 | <2 |
| 7 | <10 | <10 | 987 | 104 | 408 | 236 | 240 | <2 |
| 7 | 14 | <10 | 899 | 271 | 891 | 209 | 383 | <2 |
| 8 | <10 | 12 | 779 | 116 | 99 | 186 | 452 | <2 |
| 8 | <10 | <10 | 750 | 97 | 93 | 181 | 467 | <2 |
| 11 | <10 | <10 | 1206 | 221 | 521 | 279 | 102 | <2 |
| 9 | 11 | <10 | 1182 | 256 | 411 | 276 | 404 | <2 |
| 17 | <10 | <10 | 8710 | 695933 | 1557 | 2232 | 88 | <2 |
| 26 | <10 | <10 | 12425 | 852390 | 1926 | 3219 | 138 | <2 |
| 9 | <10 | <10 | 3172 | 128645 | 458 | 853 | 93 | <2 |
| 9 | <10 | <10 | 2258 | 54515 | 523 | 555 | 75 | <2 |
| 6 | <10 | <10 | 1192 | 213338 | 381 | 326 | 122 | <2 |
| 17 | <10 | <10 | 8865 | 752374 | 1649 | 2302 | 92 | <2 |
| 29 | 25 | 16 | 14566 | 923767 | 1994 | 3873 | 143 | <2 |
| 14 | <10 | <10 | 6030 | 202525 | 1251 | 1583 | 97 | <2 |
| 9 | <10 | <10 | 2103 | 61385 | 408 | 543 | 116 | <2 |
| <5 | <10 | <10 | 1141 | 266791 | 219 | 298 | 155 | <2 |
| <5 | <10 | <10 | 59 | 250 | 213 | 13 | 9 | <2 |
| <5 | <10 | <10 | 58 | 259 | 85 | 15 | <5 | <2 |
| <5 | <10 | <10 | 48 | 279 | 67 | 14 | 6 | <2 |
| <5 | <10 | <10 | 70 | 289 | 82 | 17 | 7 | <2 |
| <5 | <10 | <10 | 59 | 262 | 83 | 16 | 8 | <2 |
| <5 | <10 | <10 | 52 | 242 | 134 | 13 | 8 | <2 |
| 0.1M Hydroxylamine-HCl Extraction | | | | | | | | |
| <5 | <10 | <10 | 146 | 4324 | 110 | 42 | 107 | <2 |
| <5 | <10 | <10 | <5 | 411 | 147 | <5 | 336 | <2 |
| <5 | <10 | <10 | 942 | 4134 | 2471 | 249 | 1833 | <2 |
| <5 | <10 | <10 | 425 | 1638 | 2935 | 124 | 1338 | <2 |
| 29 | 11 | <10 | 3196 | 1056 | 4284 | 778 | 495 | <2 |
| 26 | <10 | <10 | 2983 | 1077 | 4364 | 699 | 499 | <2 |
| 11 | 24 | <10 | 1233 | 541 | 7085 | 287 | 295 | <2 |
| 12 | 70 | <10 | 1272 | 700 | 15937 | 313 | 465 | <2 |
| 24 | 17 | <10 | 2893 | 925 | 4532 | 693 | 470 | <2 |
| 29 | 15 | <10 | 3196 | 1124 | 4211 | 757 | 425 | <2 |
| 9 | 19 | <10 | 1193 | 604 | 4957 | 290 | 190 | <2 |
| 12 | 42 | <10 | 1134 | 562 | 5735 | 277 | 432 | <2 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| <5 | <10 | 12 | 2423 | 708006 | 2621 | 691 | 2398 | <2 |
| 14 | <10 | <10 | 3868 | 93727 | 3021 | 1027 | 974 | <2 |
| 16 | <10 | <10 | 3750 | 48013 | 3872 | 923 | 811 | <2 |
| 9 | <10 | <10 | 1633 | 285167 | 2445 | 435 | 759 | <2 |
| 6 | <10 | <10 | 2208 | 522888 | 3750 | 628 | 1863 | <2 |
| 8 | <10 | <10 | 3016 | 710266 | 4019 | 889 | 2434 | <2 |
| 8 | <10 | <10 | 2366 | 482225 | 2910 | 679 | 985 | <2 |
| 14 | <10 | <10 | 3241 | 22363 | 2463 | 794 | 497 | <2 |
| 9 | <10 | <10 | 1816 | 264161 | 2645 | 462 | 571 | <2 |

| Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) | Ta (ppb) | Tb (ppb) | Te (ppb) |
|---|---|---|---|---|---|---|---|---|
| Na-acetate Extraction | | | | | | | | |
| 32 | 219 | <200 | 1273 | <20 | 7084 | <20 | 126 | 31 |
| 69 | 167 | <200 | 458 | <20 | 4142 | <20 | 53 | <20 |
| 15 | 237 | <200 | 311 | <20 | 6966 | <20 | 35 | <20 |
| <5 | <100 | <200 | 84 | <20 | 2636 | <20 | 9 | <20 |
| 16 | <100 | <200 | 177 | <20 | 20277 | <20 | 23 | <20 |
| 13 | <100 | <200 | 150 | <20 | 18213 | <20 | 19 | <20 |
| 6 | <100 | <200 | 223 | <20 | 6183 | <20 | 25 | <20 |
| 17 | <100 | <200 | 204 | <20 | 3910 | <20 | 24 | <20 |
| 16 | <100 | <200 | 164 | <20 | 18541 | <20 | 20 | 23 |
| 17 | <100 | <200 | 164 | <20 | 20039 | <20 | 21 | <20 |
| <5 | <100 | <200 | 254 | <20 | 10639 | <20 | 32 | <20 |
| 19 | <100 | <200 | 241 | <20 | 5258 | <20 | 34 | <20 |
| <5 | <100 | <200 | 1287 | <20 | 3156 | <20 | 107 | <20 |
| <5 | <100 | <200 | 1689 | <20 | 3830 | <20 | 150 | <20 |
| <5 | <100 | <200 | 507 | <20 | 929 | <20 | 41 | <20 |
| <5 | <100 | <200 | 359 | <20 | 514 | <20 | 33 | <20 |
| <5 | <100 | <200 | 190 | <20 | 71 | <20 | 16 | <20 |
| <5 | <100 | <200 | 1353 | <20 | 4085 | <20 | 115 | <20 |
| <5 | <100 | <200 | 2006 | <20 | 5128 | <20 | 163 | <20 |
| <5 | <100 | <200 | 850 | <20 | 1592 | <20 | 70 | <20 |
| <5 | <100 | <200 | 323 | <20 | 477 | <20 | 29 | <20 |
| <5 | <100 | <200 | 176 | <20 | 62 | <20 | 14 | <20 |
| <5 | <100 | <200 | 10 | <20 | 2731 | <20 | <5 | <20 |
| <5 | <100 | <200 | 8 | <20 | 2730 | <20 | <5 | <20 |
| 8 | <100 | <200 | 14 | <20 | 2510 | <20 | <5 | <20 |
| <5 | <100 | <200 | 6 | <20 | 3485 | <20 | <5 | <20 |
| <5 | <100 | <200 | 9 | <20 | 2802 | <20 | <5 | <20 |
| 10 | <100 | <200 | 9 | <20 | 2458 | <20 | <5 | <20 |
| 0.1M Hydroxylamine-HCl Extraction | | | | | | | | |
| <5 | <100 | <200 | 30 | <20 | 3002 | <20 | <5 | <20 |
| 30 | <100 | <200 | <5 | <20 | 1881 | <20 | <5 | <20 |
| <5 | 268 | <200 | 148 | <20 | 1688 | <20 | 18 | <20 |
| <5 | 117 | <200 | 69 | <20 | 1379 | <20 | 9 | <20 |
| <5 | 231 | <200 | 723 | <20 | 9527 | <20 | 93 | <20 |
| <5 | 212 | <200 | 619 | <20 | 9136 | <20 | 86 | <20 |
| <5 | <100 | <200 | 282 | <20 | 1636 | <20 | 36 | <20 |
| <5 | <100 | <200 | 311 | <20 | 2265 | <20 | 41 | <20 |
| <5 | 220 | <200 | 635 | <20 | 10256 | <20 | 90 | <20 |
| <5 | 213 | <200 | 638 | <20 | 11048 | <20 | 92 | <20 |
| <5 | <100 | <200 | 257 | <20 | 1685 | <20 | 36 | <20 |
| <5 | <100 | <200 | 241 | <20 | 1419 | <20 | 38 | <20 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| <5 | 313 | <200 | 255 | <20 | 2379 | <20 | 29 | <20 |
| <5 | 169 | <200 | 594 | <20 | 3752 | <20 | 58 | <20 |
| <5 | 213 | <200 | 584 | <20 | 2749 | <20 | 58 | <20 |
| <5 | 122 | <200 | 268 | <20 | 1767 | <20 | 26 | 34 |
| <5 | 225 | <200 | 270 | <20 | 2171 | <20 | 26 | <20 |
| <5 | 289 | <200 | 373 | <20 | 2416 | <20 | 34 | <20 |
| <5 | 202 | <200 | 347 | <20 | 3147 | <20 | 38 | <20 |
| <5 | 102 | <200 | 518 | <20 | 2793 | <20 | 45 | <20 |
| <5 | 144 | <200 | 323 | <20 | 2465 | <20 | 34 | 34 |

| Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) | Y (ppb) | Yb (ppb) | Zn (ppb) |
|---|---|---|---|---|---|---|---|---|
| Na-acetate Extraction | | | | | | | | |
| 1721 | 2 | 30 | 82 | 729 | <10 | 3932 | 217 | 373 |
| 936 | <1 | 15 | 124 | 735 | <10 | 1243 | 88 | 424 |
| 1323 | <1 | 9 | 142 | 757 | <10 | 841 | 60 | 267 |
| 441 | <1 | <5 | 51 | 723 | <10 | 215 | 11 | 1651 |
| 177 | 2 | 9 | 43 | 130 | <10 | 707 | 49 | 112 |
| 155 | 1 | 7 | 40 | 269 | <10 | 630 | 49 | 113 |
| 163 | <1 | 7 | 24 | 175 | <10 | 755 | 53 | 165 |
| 177 | <1 | 7 | 57 | 145 | <10 | 742 | 49 | 13009 |
| 159 | 1 | 6 | 39 | 179 | <10 | 634 | 47 | 150 |
| 154 | 2 | 7 | 38 | 210 | <10 | 648 | 51 | 137 |
| 204 | <1 | 10 | 32 | 112 | <10 | 938 | 66 | 227 |
| 204 | <1 | 9 | 58 | 115 | <10 | 1021 | 66 | 12872 |
| 595 | 1 | 19 | 557 | 772 | <10 | 2390 | 139 | 1406 |
| 649 | 1 | 29 | 676 | 152 | <10 | 3664 | 169 | 3114 |
| 334 | 4 | 10 | 180 | <50 | <10 | 982 | 71 | 433 |
| 306 | <1 | 9 | 161 | <50 | <10 | 739 | 64 | 233 |
| 426 | <1 | 5 | 114 | 208 | <10 | 308 | 29 | 217 |
| 575 | 1 | 20 | 681 | 100 | <10 | 2532 | 116 | 1842 |
| 623 | 1 | 31 | 721 | 358 | 11 | 4505 | 186 | 3213 |
| 403 | <1 | 14 | 393 | 88 | <10 | 1835 | 95 | 1346 |
| 279 | 4 | 9 | 110 | <50 | <10 | 709 | 59 | 498 |
| 469 | <1 | <5 | 114 | <50 | <10 | 334 | 30 | 405 |
| 28 | <1 | <5 | 18 | <50 | <10 | 42 | <5 | 6111 |
| <20 | <1 | <5 | 11 | <50 | <10 | 38 | <5 | 12409 |
| 20 | <1 | <5 | 8 | <50 | <10 | 47 | <5 | 94377 |
| 22 | <1 | <5 | 13 | <50 | <10 | 55 | <5 | 72559 |
| <20 | <1 | <5 | 15 | <50 | <10 | 41 | <5 | 18557 |
| 22 | <1 | <5 | 9 | <50 | <10 | 41 | 6 | 106557 |
| 0.1M Hydroxylamine-HCl Extraction | | | | | | | | |
| <20 | <1 | <5 | <5 | 1652 | <10 | 102 | <5 | 1037 |
| <20 | <1 | <5 | <5 | 2116 | <10 | 9 | <5 | 311 |
| 50 | 1 | 8 | 15 | 4926 | <10 | 496 | 34 | 8145 |
| 31 | <1 | <5 | 8 | 4909 | <10 | 194 | 20 | 6474 |
| 22 | 2 | 31 | 151 | 3174 | <10 | 2568 | 180 | 3910 |
| 26 | 1 | 24 | 138 | 2929 | <10 | 2448 | 156 | 3811 |
| 32 | <1 | 10 | 95 | 3027 | <10 | 992 | 77 | 1845 |
| 32 | <1 | 11 | 94 | 3397 | <10 | 1156 | 78 | 6786 |
| <20 | 4 | 30 | 139 | 3187 | <10 | 2426 | 184 | 4266 |
| 22 | 2 | 30 | 147 | 3226 | <10 | 2610 | 168 | 4022 |
| 24 | 1 | 9 | 98 | 3005 | <10 | 987 | 71 | 1729 |
| 25 | 1 | 13 | 89 | 2839 | <10 | 1044 | 78 | 4822 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 40 | 6 | 8 | 72 | 4271 | <10 | 889 | 41 | 14359 |
| <20 | 3 | 18 | 86 | 2936 | <10 | 1476 | 113 | 8062 |
| <20 | 2 | 20 | 71 | 4280 | <10 | 1427 | 110 | 10562 |
| <20 | 3 | 9 | 49 | 1970 | <10 | 679 | 43 | 4782 |
| 43 | 6 | 6 | 90 | 4059 | <10 | 788 | 44 | 11540 |
| 43 | 7 | 14 | 115 | 4738 | <10 | 1092 | 34 | 15231 |
| 21 | 3 | 12 | 82 | 3118 | <10 | 1071 | 50 | 9530 |
| <20 | 3 | 13 | 66 | 1958 | <10 | 1224 | 83 | 4842 |
| <20 | 2 | 9 | 37 | 2152 | <10 | 793 | 56 | 5073 |

| Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) | P (ppm) | Tl (ppb) |
|---|---|---|---|---|---|---|---|
| Na-acetate Extraction | | | | | | | |
| 514 | 7202 | 93 | 220 | 2937 | 128735 | <5 | <5 |
| 408 | 9284 | 439 | 125 | 4907 | 118521 | <5 | 8 |
| 700 | 2416 | 351 | 286 | 777 | 205728 | <5 | 11 |
| 230 | 2674 | 217 | 93 | 1192 | 164672 | <5 | 7 |
| 26 | 6464 | 13 | 335 | 121 | 17287 | 89 | 7 |
| 27 | 6508 | 8 | 320 | 107 | 13395 | 81 | 6 |
| <20 | 3231 | 7 | 34 | 93 | 34747 | 17 | <5 |
| <20 | 1783 | 10 | 33 | 108 | 35231 | 14 | <5 |
| 40 | 5910 | 21 | 280 | 117 | 20093 | 79 | 6 |
| <20 | 5963 | 19 | 298 | 129 | 26748 | 83 | 8 |
| <20 | 5035 | 10 | 38 | 109 | 28807 | 18 | <5 |
| <20 | 2040 | 15 | 41 | 141 | 38340 | 17 | <5 |
| 94 | 720 | 569 | 12 | 305 | 109956 | 8 | 11 |
| 78 | 850 | 423 | 39 | 372 | 133255 | 7 | 11 |
| 23 | 187 | 46 | 20 | 111 | 38986 | <5 | <5 |
| 40 | 151 | 45 | 37 | 145 | 11294 | <5 | <5 |
| 27 | 18 | 291 | 12 | 60 | 1609 | <5 | <5 |
| 85 | 1001 | 651 | 34 | 225 | 117384 | 12 | 12 |
| 115 | 1002 | 409 | 38 | 309 | 174915 | 9 | 7 |
| 65 | 430 | 146 | 33 | 245 | 61437 | <5 | <5 |
| 29 | 63 | 45 | 10 | 96 | 9757 | <5 | <5 |
| 36 | 5 | 359 | 8 | 66 | 1121 | <5 | <5 |
| <20 | 15931 | 94 | <5 | 7879 | 16565 | <5 | <5 |
| <20 | 16036 | 99 | <5 | 7453 | 15828 | <5 | <5 |
| <20 | 14718 | 109 | <5 | 7097 | 35549 | <5 | <5 |
| <20 | 19292 | 130 | <5 | 9635 | 29617 | <5 | <5 |
| <20 | 16604 | 107 | <5 | 7943 | 17494 | <5 | <5 |
| <20 | 14363 | 112 | <5 | 7142 | 36244 | <5 | <5 |
| 0.1M Hydroxylamine-HCl Extraction | | | | | | | |
| <20 | 5686 | 679 | 61 | 3256 | 76155 | 152 | <5 |
| <20 | 6755 | 440 | 50 | 4165 | 52987 | 14 | <5 |
| 160 | 397 | 3462 | 210 | 724 | 103015 | 262 | 9 |
| 239 | 1644 | 2670 | 111 | 1181 | 129274 | 88 | <5 |
| <20 | 1028 | 406 | 296 | 778 | 237940 | 393 | 26 |
| <20 | 979 | 389 | 290 | 766 | 218631 | 378 | 27 |
| <20 | 518 | 227 | 54 | 136 | 139754 | 332 | 5 |
| <20 | 514 | 337 | 85 | 131 | 216129 | 304 | 8 |
| <20 | 968 | 406 | 274 | 717 | 269133 | 367 | 35 |
| <20 | 1066 | 410 | 272 | 787 | 244329 | 395 | 24 |
| <20 | 565 | 267 | 55 | 130 | 125285 | 291 | <5 |
| 31 | 509 | 289 | 64 | 123 | 114698 | 286 | 7 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 65 | 525 | 2953 | 154 | 1102 | 41774 | 826 | 34 |
| <20 | 1084 | 1517 | 90 | 589 | 64250 | 524 | 10 |
| <20 | 763 | 2362 | 91 | 742 | 41995 | 305 | 7 |
| <20 | 555 | 2880 | 72 | 975 | 24352 | 307 | 13 |
| 169 | 377 | 2836 | 132 | 924 | 36204 | 745 | 33 |
| 311 | 504 | 3138 | 166 | 1154 | 50756 | 816 | 37 |
| 140 | 850 | 2261 | 98 | 717 | 34603 | 484 | 16 |
| <20 | 832 | 1068 | 43 | 440 | 19312 | 381 | <5 |
| <20 | 717 | 3101 | 76 | 938 | 24361 | 301 | 9 |

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) | Ba (ppb) | Be (ppb) |
|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl Extraction | | | | | | |
| Talbot/T7 A Soil Top | 53 | 441 | 153 | 5 | 5526 | 72 |
| Talbot/T7 A Soil Bottom | 12 | 202 | <100 | 8 | 3707 | 74 |
| Talbot/T7 B Soil Top | 35 | 817 | <100 | 3 | 4699 | 101 |
| Talbot/T7 B Soil Bottom | 7 | 571 | 156 | 3 | 5475 | 102 |
| Arrieros/LB A Soil Top | 11 | 452 | 1738 | <1 | 14927 | 52 |
| Arrieros/LB A Soil Bottom | 8 | 456 | 1911 | 2 | 14851 | 79 |
| Arrieros/LB A Grav Top | <3 | 180 | 336 | 2 | 2495 | 80 |
| Arrieros/LB A Grav Bottom | 6 | 182 | 248 | <1 | 4381 | 54 |
| Arrieros/LB B Soil Top | 7 | 454 | 1488 | <1 | 14766 | 54 |
| Arrieros/LB B Soil Bottom | 8 | 491 | 1891 | <1 | 14919 | 55 |
| Arrieros/LB B Grav Top | <3 | 179 | 162 | <1 | 3573 | <20 |
| Arrieros/LB B Grav Bottom | 5 | 188 | 431 | <1 | 2071 | 85 |
| Raglan A Soil Top | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| Raglan A Soil Bottom | 52 | 936 | <100 | <1 | 5412 | 58 |
| Raglan A Till Top | 16 | 461 | <100 | <1 | 2529 | 59 |
| Raglan A Till Middle | 10 | 531 | <100 | <1 | 2061 | <20 |
| Raglan A Till Bottom | <3 | 292 | <100 | <1 | 1417 | <20 |
| Raglan B Soil Top | 49 | 870 | <100 | <1 | 5039 | <20 |
| Raglan B Soil Bottom | 43 | 981 | <100 | <1 | 5316 | <20 |
| Raglan B Till Top | 13 | 601 | <100 | <1 | 3809 | 31 |
| Raglan B Till Middle | 9 | 342 | 116 | <1 | 1278 | 32 |
| Raglan B Till Bottom | <3 | 289 | <100 | <1 | 1660 | <20 |

| | Ag (ppb) | As (ppm) | Au (ppb) | Ba (ppm) | B (ppm) | Bi (ppm) |
|---|---|---|---|---|---|---|
| Aqua Regia Extraction | | | | | | |
| Talbot/T7 A Soil Top | 150 | 3.6 | 1.1 | 132.5 | <20 | 0.26 |
| Talbot/T7 A Soil Bottom | 32 | 1.4 | 1.0 | 68.4 | <20 | 0.14 |
| Talbot/T7 B Soil Top | 69 | 3.1 | <0.2 | 129.2 | <20 | 0.27 |
| Talbot/T7 B Soil Bottom | 24 | 2.5 | <0.2 | 65.6 | <20 | 0.19 |
| Arrieros/LB A Soil Top | 27 | 22.9 | 0.5 | 118.0 | <20 | 0.22 |
| Arrieros/LB A Soil Bottom | 33 | 25.1 | 0.3 | 123.7 | <20 | 0.27 |
| Arrieros/LB B Soil Top | 28 | 21.9 | 0.5 | 118.3 | 21 | 0.33 |
| Arrieros/LB B Soil Bottom | 42 | 23.4 | <0.2 | 120.3 | <20 | 0.23 |
| Raglan A Soil Top | 120 | 1.4 | <0.2 | 70.8 | <20 | 0.07 |
| Raglan A Soil Bottom | 108 | 1.4 | <0.2 | 67.3 | <20 | 0.06 |
| Raglan A Till Top | 46 | 1.6 | 0.3 | 45.9 | <20 | 0.05 |
| Raglan A Till Middle | 25 | 3.4 | <0.2 | 47.8 | <20 | 0.07 |
| Raglan A Till Bottom | 905 | <0.1 | 10.1 | 31.2 | <20 | 0.18 |
| Raglan B Soil Top | 102 | 1.1 | <0.2 | 59.9 | <20 | 0.05 |
| Raglan B Soil Bottom | 147 | 2.0 | 0.6 | 87.3 | <20 | 0.09 |
| Raglan B Till Top | 76 | 1.9 | <0.2 | 68.8 | <20 | 0.06 |
| Raglan B Till Middle | 52 | 2.2 | <0.2 | 50.2 | <20 | 0.05 |
| Raglan B Till Bottom | 507 | 0.7 | 5.7 | 32.9 | <20 | 0.10 |

| Bi (ppb) | Cd (ppb) | Ce (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) | Dy (ppb) | Er (ppb) | Eu (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl Extraction | | | | | | | | |
| 12 | <20 | 2564 | 1148 | <5 | 1867 | 140 | 84 | 45 |
| 16 | <20 | 1662 | 1092 | 7 | 203 | 45 | 19 | 17 |
| 8 | <20 | 1620 | 1262 | 25 | 893 | 30 | 14 | 9 |
| 10 | <20 | 2659 | 2020 | 17 | 239 | 23 | 12 | 7 |
| 13 | <20 | 3841 | 595 | 58 | 4059 | 143 | 78 | 37 |
| 13 | 21 | 4234 | 547 | 63 | 4248 | 165 | 86 | 40 |
| 11 | <20 | 3284 | 319 | 66 | 1232 | 118 | 71 | 35 |
| 27 | <20 | 3537 | 403 | 67 | 14747 | 122 | 67 | 28 |
| 11 | 27 | 3769 | 539 | 79 | 4331 | 139 | 75 | 31 |
| 11 | 32 | 5896 | 733 | 67 | 4438 | 160 | 94 | 34 |
| 9 | <20 | 2498 | 283 | 61 | 1241 | 133 | 57 | 32 |
| 18 | <20 | 2658 | 289 | 67 | 17613 | 128 | 76 | 36 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| <5 | <20 | 2633 | 2326 | 226 | 551 | 33 | 26 | 19 |
| <5 | <20 | 4141 | 1698 | 75 | 2505 | 58 | 33 | 26 |
| <5 | <20 | 2186 | 1588 | 55 | 6299 | 56 | 25 | 22 |
| <5 | <20 | 1047 | 1626 | 69 | 1953 | 18 | 14 | 11 |
| 15 | <20 | 2514 | 2091 | 226 | 493 | 35 | 19 | 22 |
| <5 | <20 | 2762 | 3136 | 240 | 585 | 49 | 30 | 20 |
| <5 | <20 | 2639 | 2545 | 82 | 510 | 46 | 29 | 25 |
| <5 | <20 | 1809 | 755 | 59 | 2556 | 35 | 19 | 18 |
| <5 | <20 | 1128 | 1651 | 60 | 2985 | 25 | 17 | 15 |

| Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Ga (ppm) | Hg (ppb) | La (ppm) | Mo (ppm) | Ni (ppm) |
|---|---|---|---|---|---|---|---|---|
| Aqua Regia Extraction | | | | | | | | |
| 0.04 | 15.1 | 68.4 | 32.95 | 8.3 | 31 | 51.8 | 0.14 | 49.1 |
| 0.05 | 9.0 | 34.1 | 14.33 | 4.4 | 14 | 14.8 | 0.12 | 21.1 |
| 0.06 | 17.7 | 70.9 | 21.00 | 8.8 | 23 | 22.7 | 0.18 | 41.7 |
| 0.07 | 16.1 | 40.4 | 12.28 | 4.9 | 13 | 13.6 | 0.27 | 20.9 |
| 0.18 | 8.5 | 11.9 | 29.74 | 3.4 | 10 | 14.2 | 1.26 | 9.7 |
| 0.23 | 8.8 | 13.2 | 32.19 | 3.8 | 13 | 18.2 | 1.24 | 10.2 |
| 0.20 | 8.3 | 13.9 | 29.76 | 3.7 | 7 | 14.4 | 1.28 | 9.7 |
| 0.22 | 8.4 | 12.7 | 28.55 | 3.5 | 12 | 16.0 | 1.33 | 9.3 |
| 0.17 | 34.3 | 29.9 | 22.23 | 3.0 | 64 | 52.5 | 0.56 | 1640.5 |
| 0.21 | 31.6 | 22.5 | 23.85 | 2.9 | 48 | 52.3 | 0.53 | 1566.7 |
| 0.17 | 14.0 | 22.9 | 19.29 | 3.3 | 20 | 31.3 | 0.53 | 247.4 |
| 0.09 | 12.1 | 32.8 | 35.33 | 3.9 | 9 | 21.3 | 0.97 | 129.9 |
| 0.22 | 192.1 | 184.3 | 3514.30 | 3.1 | 39 | 11.0 | 0.42 | 5688.1 |
| 0.11 | 22.4 | 21.7 | 20.37 | 2.1 | 50 | 41.5 | 0.55 | 1186.3 |
| 0.28 | 46.8 | 27.9 | 44.85 | 3.6 | 79 | 90.4 | 0.80 | 2298.2 |
| 0.19 | 34.0 | 31.2 | 47.46 | 4.1 | 36 | 46.0 | 0.59 | 1361.1 |
| 0.10 | 9.6 | 27.0 | 26.67 | 3.5 | 10 | 20.5 | 0.64 | 152.8 |
| 0.23 | 111.3 | 118.0 | 1923.57 | 3.2 | 24 | 13.0 | 0.47 | 3242.4 |

| Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) | La (ppb) | Li (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl Extraction | | | | | | | | |
| 26 | 242 | <50 | <20 | <5 | 33 | <10 | 2757 | 1790 |
| 20 | 75 | <50 | <20 | 6 | <20 | <10 | 776 | 929 |
| 53 | 40 | <50 | <20 | <5 | <20 | <10 | 548 | 2914 |
| 51 | 14 | <50 | <20 | <5 | <20 | <10 | 515 | 2048 |
| 25 | 200 | <50 | <20 | <5 | 30 | <10 | 1329 | 3668 |
| 22 | 190 | <50 | <20 | <5 | 29 | <10 | 1281 | 4021 |
| <20 | 159 | <50 | <20 | <5 | 26 | <10 | 1156 | 1270 |
| 21 | 170 | <50 | <20 | 13 | 25 | <10 | 969 | 763 |
| 23 | 197 | <50 | <20 | <5 | 27 | <10 | 1273 | 3603 |
| 28 | 194 | <50 | <20 | <5 | 36 | <10 | 1485 | 3579 |
| <20 | 187 | <50 | <20 | 17 | 28 | <10 | 1089 | 1215 |
| <20 | 178 | <50 | <20 | <5 | 28 | <10 | 1040 | 1210 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 107 | 72 | <50 | <20 | 5 | <20 | <10 | 2227 | 2741 |
| 53 | 106 | <50 | <20 | <5 | <20 | <10 | 1868 | 1935 |
| 69 | 88 | <50 | <20 | 10 | <20 | <10 | 1092 | 1637 |
| 34 | 40 | <50 | <20 | 9 | <20 | <10 | 604 | 940 |
| 121 | 85 | <50 | <20 | 28 | <20 | <10 | 2117 | 2959 |
| 107 | 91 | <50 | <20 | 18 | <20 | <10 | 2833 | 3518 |
| 49 | 109 | <50 | <20 | <5 | <20 | <10 | 1925 | 2537 |
| 42 | 63 | <50 | <20 | 9 | <20 | <10 | 918 | 1194 |
| 31 | 53 | <50 | <20 | <5 | <20 | <10 | 662 | 1167 |

| Pb (ppm) | Se (ppm) | Sc (ppm) | Sb (ppm) | Sr (ppm) | Te (ppm) | Th (ppm) | Tl (ppm) | U (ppm) |
|---|---|---|---|---|---|---|---|---|
| Aqua Regia Extraction | | | | | | | | |
| 14.03 | 0.2 | 6.7 | 0.13 | 26.6 | <0.02 | 14.3 | 0.30 | 0.8 |
| 9.45 | 0.2 | 3.1 | 0.24 | 14.8 | <0.02 | 6.5 | 0.16 | 0.5 |
| 14.62 | 0.4 | 6.2 | 0.06 | 22.8 | <0.02 | 12.2 | 0.29 | 0.8 |
| 14.02 | 0.3 | 3.0 | 0.05 | 13.0 | <0.02 | 6.6 | 0.15 | 0.4 |
| 13.13 | 0.4 | 3.0 | 0.27 | 64.1 | <0.02 | 5.3 | 0.14 | 0.9 |
| 14.33 | 0.2 | 3.2 | 0.29 | 70.2 | 0.05 | 6.0 | 0.15 | 0.9 |
| 15.30 | 0.2 | 3.0 | 0.33 | 67.9 | <0.02 | 7.5 | 0.14 | 1.3 |
| 13.31 | 0.1 | 3.2 | 0.29 | 66.5 | 0.04 | 5.3 | 0.15 | 0.8 |
| 8.45 | 0.4 | 1.1 | 0.09 | 12.5 | <0.02 | 1.5 | 0.20 | 1.9 |
| 8.00 | 0.5 | 1.1 | 0.09 | 12.3 | <0.02 | 1.5 | 0.20 | 1.7 |
| 7.85 | 0.2 | 1.6 | 0.07 | 14.2 | <0.02 | 6.6 | 0.20 | 1.5 |
| 10.04 | 0.3 | 2.3 | 0.12 | 10.2 | <0.02 | 7.5 | 0.16 | 1.4 |
| 7.59 | 6.6 | 2.4 | 0.04 | 7.9 | 0.92 | 4.4 | 0.19 | 0.9 |
| 6.82 | 0.4 | 0.8 | 0.08 | 10.9 | <0.02 | 1.0 | 0.17 | 1.6 |
| 11.03 | 0.8 | 1.5 | 0.11 | 17.8 | 0.04 | 2.3 | 0.26 | 2.3 |
| 9.41 | 0.5 | 1.8 | 0.08 | 14.8 | <0.02 | 4.2 | 0.24 | 1.8 |
| 7.77 | 0.4 | 1.8 | 0.08 | 14.0 | <0.02 | 6.4 | 0.20 | 1.4 |
| 7.39 | 4.0 | 2.0 | 0.04 | 9.4 | 0.44 | 5.2 | 0.17 | 1.0 |

| Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) | Rb (ppb) | Re (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl Extraction | | | | | | | | |
| 8 | <10 | 15 | 1609 | 5486 | 977 | 445 | 322 | <2 |
| <5 | <10 | 13 | 493 | 1096 | 1478 | 134 | 376 | <2 |
| <5 | <10 | 30 | 326 | 3302 | 1216 | 86 | 2138 | <2 |
| <5 | 10 | 39 | 262 | 1908 | 2094 | 79 | 1389 | <2 |
| 7 | 165 | 11 | 1060 | 870 | 1700 | 274 | 643 | <2 |
| 9 | 184 | 22 | 1050 | 852 | 1777 | 256 | 644 | <2 |
| 10 | 64 | <10 | 972 | 460 | 1314 | 221 | 413 | <2 |
| 6 | 219 | <10 | 746 | 455 | 2031 | 188 | 468 | <2 |
| 8 | 190 | 17 | 1086 | 832 | 1439 | 259 | 679 | <2 |
| 12 | 187 | 21 | 1222 | 961 | 1585 | 295 | 684 | <2 |
| 9 | 71 | <10 | 877 | 449 | 832 | 213 | 440 | <2 |
| 10 | 200 | <10 | 880 | 385 | 956 | 201 | 521 | <2 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| <5 | 25 | 36 | 1073 | 79995 | 491 | 296 | 4195 | <2 |
| <5 | 32 | 22 | 998 | 14610 | 776 | 296 | 1579 | <2 |
| <5 | 74 | 27 | 777 | 8369 | 854 | 224 | 1127 | <2 |
| <5 | 27 | 15 | 359 | 76110 | 224 | 95 | 781 | <2 |
| <5 | 46 | 51 | 1028 | 64833 | 92 | 273 | 3880 | <2 |
| <5 | 30 | 71 | 1123 | 107256 | <20 | 326 | 4295 | <2 |
| <5 | 11 | 32 | 1009 | 70543 | 371 | 262 | 1774 | <2 |
| <5 | 45 | 32 | 593 | 3348 | 147 | 167 | 967 | <2 |
| <5 | 19 | 14 | 410 | 62344 | 27 | 104 | 715 | <2 |

| W (ppm) | V (ppm) | Zn (ppm) | Al (%) | Ti (%) | Na (%) | K (%) | Ca (%) | Fe (%) |
|---|---|---|---|---|---|---|---|---|
| Aqua Regia Extraction | | | | | | | | |
| <0.1 | 54 | 71.1 | 2.57 | 0.116 | 0.025 | 0.54 | 1.70 | 3.32 |
| <0.1 | 33 | 47.6 | 1.31 | 0.073 | 0.011 | 0.27 | 2.54 | 1.84 |
| <0.1 | 59 | 75.3 | 2.83 | 0.123 | 0.021 | 0.55 | 0.45 | 3.50 |
| <0.1 | 45 | 68.2 | 1.35 | 0.090 | 0.011 | 0.24 | 0.83 | 2.42 |
| <0.1 | 51 | 47.0 | 1.04 | 0.057 | 0.044 | 0.27 | 0.92 | 1.95 |
| <0.1 | 53 | 51.0 | 1.13 | 0.059 | 0.048 | 0.30 | 1.00 | 2.02 |
| <0.1 | 54 | 48.3 | 1.06 | 0.063 | 0.047 | 0.27 | 0.88 | 2.03 |
| <0.1 | 53 | 47.7 | 1.07 | 0.061 | 0.044 | 0.27 | 0.94 | 2.00 |
| <0.1 | 23 | 38.1 | 0.86 | 0.052 | 0.011 | 0.12 | 0.21 | 1.61 |
| <0.1 | 22 | 43.2 | 0.82 | 0.059 | 0.009 | 0.16 | 0.18 | 1.51 |
| <0.1 | 25 | 46.1 | 0.87 | 0.097 | 0.005 | 0.22 | 0.21 | 1.85 |
| <0.1 | 35 | 59.4 | 1.15 | 0.105 | 0.003 | 0.17 | 0.17 | 2.84 |
| <0.1 | 25 | 53.0 | 1.11 | 0.075 | 0.006 | 0.16 | 0.15 | 8.03 |
| <0.1 | 17 | 29.4 | 0.62 | 0.043 | 0.009 | 0.10 | 0.17 | 1.31 |
| <0.1 | 27 | 52.1 | 1.00 | 0.073 | 0.012 | 0.19 | 0.26 | 1.80 |
| <0.1 | 30 | 55.5 | 1.08 | 0.090 | 0.010 | 0.23 | 0.23 | 2.04 |
| <0.1 | 28 | 51.0 | 0.96 | 0.107 | 0.005 | 0.22 | 0.19 | 2.14 |
| <0.1 | 25 | 49.9 | 1.00 | 0.085 | 0.007 | 0.17 | 0.16 | 5.33 |

| Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) | Ta (ppb) | Tb (ppb) | Te (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl Extraction | | | | | | | | |
| <5 | 367 | <200 | 250 | <20 | 1276 | <20 | 29 | <20 |
| 20 | 128 | <200 | 116 | <20 | 1477 | <20 | 10 | <20 |
| <5 | 447 | <200 | 64 | <20 | 458 | <20 | 8 | <20 |
| <5 | 308 | <200 | 43 | <20 | 437 | <20 | <5 | <20 |
| <5 | 391 | <200 | 220 | <20 | 6213 | <20 | 27 | <20 |
| <5 | 389 | <200 | 233 | <20 | 5986 | <20 | 27 | <20 |
| <5 | 167 | <200 | 184 | <20 | 726 | <20 | 25 | <20 |
| 6 | 184 | <200 | 155 | <20 | 1219 | <20 | 25 | <20 |
| <5 | 397 | <200 | 206 | <20 | 6297 | <20 | 28 | <20 |
| <5 | 391 | <200 | 265 | <20 | 6835 | <20 | 35 | <20 |
| <5 | 191 | <200 | 173 | <20 | 786 | <20 | 19 | <20 |
| <5 | 163 | <200 | 199 | <20 | 645 | <20 | 24 | <20 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| <5 | 503 | <200 | 121 | <20 | 431 | <20 | 5 | <20 |
| <5 | 261 | <200 | 155 | <20 | 443 | <20 | 15 | <20 |
| <5 | 290 | <200 | 169 | <20 | 281 | <20 | 13 | <20 |
| <5 | 227 | <200 | 47 | <20 | 262 | <20 | <5 | <20 |
| <5 | 452 | <200 | 127 | <20 | 428 | <20 | 8 | <20 |
| <5 | 475 | <200 | 114 | <20 | 451 | <20 | 6 | <20 |
| <5 | 299 | <200 | 154 | <20 | 439 | <20 | 8 | <20 |
| <5 | 151 | <200 | 80 | <20 | 309 | <20 | 6 | <20 |
| <5 | 199 | <200 | 59 | <20 | 214 | <20 | <5 | 24 |

| S (%) | P (%) | Mn (ppm) | Mg (%) |
|---|---|---|---|
| Aqua Regia Extraction | | | |
| 0.04 | 0.044 | 524 | 1.80 |
| 0.09 | 0.016 | 385 | 1.95 |
| 0.06 | 0.027 | 650 | 1.04 |
| 0.04 | 0.031 | 835 | 0.87 |
| <0.02 | 0.059 | 458 | 0.58 |
| <0.02 | 0.067 | 473 | 0.64 |
| <0.02 | 0.062 | 455 | 0.59 |
| <0.02 | 0.063 | 497 | 0.61 |
| 0.19 | 0.075 | 314 | 0.54 |
| 0.19 | 0.057 | 293 | 0.48 |
| <0.02 | 0.062 | 263 | 0.55 |
| <0.02 | 0.057 | 317 | 0.69 |
| 3.22 | 0.047 | 313 | 3.72 |
| 0.14 | 0.060 | 226 | 0.36 |
| 0.28 | 0.070 | 450 | 0.58 |
| 0.15 | 0.069 | 297 | 0.68 |
| <0.02 | 0.062 | 236 | 0.60 |
| 1.97 | 0.054 | 256 | 2.44 |

| Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) | Y (ppb) | Yb (ppb) | Zn (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl Extraction | | | | | | | | |
| 50 | 2 | 8 | 22 | 1903 | <10 | 990 | 59 | 4278 |
| 35 | 1 | <5 | 18 | 2878 | <10 | 227 | 19 | 1586 |
| 39 | 2 | <5 | 8 | 2700 | <10 | 157 | 16 | 5795 |
| 33 | 2 | <5 | 6 | 5723 | <10 | 107 | 8 | 5133 |
| <20 | 1 | 8 | 68 | 2339 | <10 | 839 | 72 | 4077 |
| <20 | 1 | 11 | 75 | 2610 | <10 | 801 | 59 | 4062 |
| <20 | <1 | 10 | 47 | 1637 | <10 | 712 | 53 | 2906 |
| <20 | <1 | 7 | 49 | 1784 | <10 | 654 | 41 | 3347 |
| <20 | 1 | 11 | 72 | 2446 | <10 | 784 | 72 | 4222 |
| <20 | <1 | 13 | 78 | 2690 | <10 | 909 | 73 | 4053 |
| 25 | <1 | 6 | 47 | 1534 | <10 | 679 | 44 | 2853 |
| 30 | <1 | 7 | 51 | 1657 | <10 | 719 | 58 | 3553 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 36 | 4 | <5 | 40 | 2341 | <10 | 278 | 8 | 8440 |
| <20 | 2 | <5 | 65 | 2282 | <10 | 320 | 24 | 5368 |
| <20 | 2 | <5 | 61 | 3509 | <10 | 314 | 30 | 7389 |
| <20 | 1 | <5 | 41 | 1425 | <10 | 131 | 18 | 2776 |
| 57 | 4 | <5 | 67 | 2049 | <10 | 267 | 12 | 7904 |
| 50 | 4 | <5 | 57 | 1942 | <10 | 283 | 15 | 8983 |
| 23 | 2 | <5 | 48 | 1825 | <10 | 346 | 15 | 6925 |
| <20 | 2 | <5 | 49 | 1698 | <10 | 168 | 10 | 3384 |
| <20 | 2 | <5 | 34 | 1393 | <10 | 154 | 10 | 3062 |

| Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) | P (ppm) | Tl (ppb) |
|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl Extraction | | | | | | | |
| 110 | 2315 | 1385 | 93 | 1670 | 174 | 27647 | <5 |
| 109 | 5864 | 1286 | 47 | 3467 | 97 | 31788 | <5 |
| 284 | 55 | 1830 | 171 | 573 | 140 | 28504 | 10 |
| 84 | 405 | 2660 | 75 | 526 | 94 | 112339 | 6 |
| 88 | 231 | 802 | 201 | 638 | 38 | 35336 | 26 |
| 79 | 214 | 851 | 192 | 651 | 42 | 35517 | 29 |
| 25 | 163 | 513 | 54 | 226 | 37 | 25131 | 12 |
| <20 | 128 | 634 | 64 | 193 | 33 | 31693 | 13 |
| 82 | 228 | 835 | 190 | 623 | 38 | 40077 | 36 |
| 71 | 217 | 869 | 195 | 676 | 47 | 38350 | 33 |
| 22 | 132 | 520 | 58 | 226 | 33 | 27285 | 11 |
| 22 | 107 | 623 | 61 | 233 | 33 | 19662 | 12 |
| I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. | I.S. |
| 65 | 48 | 2443 | 248 | 792 | 250 | 22632 | 61 |
| 43 | 43 | 1775 | 113 | 378 | 101 | 27197 | 18 |
| 97 | 21 | 2842 | 93 | 503 | 106 | 28315 | 14 |
| 31 | 24 | 2148 | 63 | 1575 | 71 | 24310 | 8 |
| 118 | 41 | 2777 | 213 | 795 | 330 | 22775 | 65 |
| 136 | 40 | 2618 | 246 | 903 | 240 | 25657 | 61 |
| 74 | 51 | 1910 | 119 | 572 | 121 | 21235 | 24 |
| 66 | 17 | 1388 | 68 | 277 | 66 | 15227 | 10 |
| 89 | 21 | 2541 | 50 | 1325 | 146 | 16351 | 7 |

| | Al (ppm) | As (ppm) | B (ppm) | Ba (ppm) | Be (ppm) | Ca (ppm) |
|---|---|---|---|---|---|---|
| HCl Extraction | | | | | | |
| Talbot/T7 A Soil Top | 314.2 | bdl | bdl | Sat | 0.050 | 1434 |
| Talbot/T7 A Soil Bottom | 196.3 | bdl | bdl | 4.57 | 0.038 | 1976 |
| Talbot/T7 B Soil Top | 400.7 | bdl | bdl | 6.78 | 0.060 | 413 |
| Talbot/T7 B Soil Bottom | 114.6 | bdl | bdl | 2.02 | 0.022 | 2034 |
| Talbot/T7 A Carb Top | 2.9 | 0.18 | bdl | 0.09 | 0.003 | 4120 |
| Talbot/T7 A Carb Middle | 1.4 | 0.15 | bdl | 0.07 | 0.003 | 3317 |
| Talbot/T7 A Carb Bottom | 1.4 | 0.11 | bdl | 0.06 | 0.002 | 2409 |
| Talbot/T7 B Carb Top | 1.4 | 0.13 | bdl | 0.08 | 0.002 | 2888 |
| Talbot/T7 B Carb Middle | 1.9 | 0.20 | bdl | 0.10 | 0.002 | 3384 |
| Talbot/T7 B Carb Bottom | 1.2 | 0.12 | bdl | 0.07 | 0.002 | 2451 |
| Arrieros/LB A Soil Top | 111.6 | 0.45 | 0.40 | 2.19 | bdl | 838 |
| Arrieros/LB A Soil Bottom | 128.3 | 0.52 | 0.50 | 2.46 | bdl | 922 |
| Arrieros/LB A Grav Top | 63.2 | 0.28 | 0.22 | 1.63 | bdl | 962 |
| Arrieros/LB A Grav Bottom | 14.6 | 0.08 | 0.01 | 1.24 | bdl | 205 |
| Arrieros/LB B Soil Top | 103.5 | 0.46 | 0.38 | 2.11 | bdl | 753 |
| Arrieros/LB B Soil Bottom | 124.8 | 0.51 | 0.46 | 2.43 | bdl | 867 |
| Arrieros/LB B Grav Top | 26.0 | 0.14 | 0.04 | 1.72 | bdl | 1086 |
| Arrieros/LB B Grav Bottom | 21.6 | 0.10 | 0.01 | 1.69 | bdl | 261 |
| Raglan A Soil Top | 227.1 | 0.18 | bdl | 5.92 | bdl | 185 |
| Raglan A Soil Bottom | 163.9 | 0.16 | bdl | 4.21 | bdl | 138 |
| Raglan A Till Top | 105.4 | 0.06 | bdl | 2.53 | bdl | 151 |
| Raglan A Till Middle | 91.9 | 0.04 | bdl | 2.17 | bdl | 100 |
| Raglan A Till Bottom | 65.2 | 0.04 | bdl | 1.36 | bdl | 82 |
| Raglan B Soil Top | 205.8 | 0.16 | bdl | 5.81 | bdl | 209 |
| Raglan B Soil Bottom | 191.9 | 0.23 | bdl | 5.12 | bdl | 191 |
| Raglan B Till Top | 122.7 | 0.08 | bdl | 3.13 | bdl | 156 |
| Raglan B Till Middle | 95.1 | 0.03 | bdl | 2.09 | bdl | 118 |
| Raglan B Till Bottom | 62.9 | 0.03 | bdl | 1.04 | bdl | 78 |

| Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) | Mg (ppm) | Mn (ppm) |
|---|---|---|---|---|---|---|---|---|
| HCl Extraction | | | | | | | | |
| 0.10 | 0.35 | 0.38 | 1.31 | 282 | 100 | 2.4 | 511 | 33 |
| 0.14 | 0.41 | 0.31 | 0.42 | 410 | 75 | 1.1 | 747 | 33 |
| 0.19 | 0.73 | 0.65 | 0.68 | 566 | 115 | 1.9 | 201 | 42 |
| 0.08 | 0.29 | 0.18 | 0.18 | 228 | 45 | 0.6 | 691 | 24 |
| 0.01 | 0.02 | bdl | 0.04 | 17 | 3 | 0.5 | 1132 | 3 |
| 0.00 | 0.02 | bdl | 0.03 | 14 | 2 | 0.4 | 846 | 3 |
| 0.00 | 0.02 | bdl | 0.04 | 11 | 1 | 0.3 | 633 | 5 |
| 0.00 | 0.02 | bdl | 0.04 | 13 | 2 | 0.3 | 756 | 3 |
| 0.00 | 0.02 | bdl | 0.04 | 13 | 2 | 0.4 | 895 | 2 |
| 0.00 | 0.02 | bdl | 0.05 | 12 | 1 | 0.3 | 644 | 4 |
| 0.02 | 0.06 | 0.01 | 0.34 | 18 | 105 | 2.2 | 46 | 6 |
| 0.02 | 0.07 | 0.01 | 0.41 | 22 | 123 | 2.5 | 52 | 6 |
| 0.01 | 0.09 | 0.01 | 0.22 | 18 | 57 | 1.2 | 34 | 13 |
| 0.02 | 0.10 | 0.02 | 20.19 | 9 | 11 | 0.2 | 12 | 8 |
| 0.02 | 0.07 | 0.01 | 0.35 | 18 | 91 | 2.0 | 45 | 7 |
| 0.02 | 0.08 | 0.01 | 0.39 | 21 | 122 | 2.4 | 54 | 8 |
| 0.01 | 0.12 | 0.03 | 0.11 | 15 | 20 | 0.4 | 20 | 13 |
| 0.03 | 0.13 | 0.02 | 28.73 | 16 | 15 | 0.3 | 16 | 12 |
| 0.14 | 0.71 | 0.21 | 1.36 | 512 | 29 | 1.6 | 132 | 24 |
| 0.10 | 0.40 | 0.16 | 0.80 | 328 | 20 | 1.3 | 96 | 19 |
| 0.05 | 0.43 | 0.12 | 0.43 | 182 | 23 | 1.0 | 59 | 10 |
| 0.05 | 0.17 | 0.13 | 0.40 | 167 | 14 | 0.8 | 51 | 4 |
| 0.04 | 0.42 | 0.27 | 4.89 | 169 | 17 | 0.6 | 56 | 2 |
| 0.12 | 0.76 | 0.15 | 1.47 | 523 | 25 | 1.2 | 86 | 24 |
| 0.10 | 0.52 | 0.17 | 1.15 | 345 | 25 | 1.5 | 104 | 31 |
| 0.07 | 0.39 | 0.14 | 0.62 | 251 | 29 | 1.1 | 80 | 9 |
| 0.04 | 0.17 | 0.11 | 0.33 | 155 | 16 | 1.0 | 53 | 4 |
| 0.04 | 0.38 | 0.21 | 3.75 | 154 | 16 | 0.7 | 60 | 2 |

| Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Se (ppm) | Si (ppm) | Sr (ppm) |
|---|---|---|---|---|---|---|---|---|
| HCl Extraction | | | | | | | | |
| bdl | 17.1 | 0.76 | 18 | 0.77 | 25 | bdl | 127 | 1.0 |
| bdl | 10.2 | 0.27 | 3 | 0.65 | 63 | bdl | 64 | 0.7 |
| bdl | 14.9 | 0.48 | 4 | 0.87 | 20 | bdl | 157 | 0.9 |
| bdl | 7.4 | 0.11 | 2 | 0.44 | 33 | bdl | 36 | 0.6 |
| 0.03 | 3.1 | 0.02 | bdl | bdl | 57 | 0.19 | 3 | 0.8 |
| 0.02 | 2.4 | 0.02 | bdl | bdl | 45 | 0.17 | 2 | 0.6 |
| 0.01 | 2.0 | 0.01 | bdl | bdl | 33 | 0.11 | 2 | 0.4 |
| 0.02 | 2.5 | 0.02 | bdl | bdl | 40 | 0.13 | 2 | 0.5 |
| 0.02 | 2.8 | 0.02 | bdl | bdl | 47 | 0.15 | 3 | 0.6 |
| 0.02 | 1.7 | 0.02 | bdl | bdl | 34 | 0.10 | 2 | 0.4 |
| 0.01 | 21.8 | 0.02 | 50 | 0.16 | 15 | bdl | 76 | 2.5 |
| 0.01 | 23.6 | 0.03 | 56 | 0.18 | 18 | bdl | 96 | 2.7 |
| 0.01 | 12.4 | 0.03 | 36 | 0.23 | 15 | bdl | 48 | 1.9 |
| 0.01 | 2.3 | 0.06 | bdl | 0.36 | 3 | bdl | 11 | 0.4 |
| 0.01 | 20.0 | 0.03 | 52 | 0.18 | 14 | bdl | 75 | 2.4 |
| 0.01 | 24.0 | 0.03 | 55 | 0.18 | 16 | bdl | 87 | 2.8 |
| 0.01 | 4.9 | 0.05 | 29 | 0.35 | 15 | bdl | 19 | 1.4 |
| 0.01 | 3.0 | 0.07 | bdl | 0.46 | 4 | bdl | 17 | 0.5 |
| bdl | 11.8 | 47.17 | 18 | 0.50 | 8 | bdl | 96 | 0.7 |
| bdl | 7.7 | 23.59 | 13 | 0.35 | 5 | bdl | 72 | 0.5 |
| bdl | 3.1 | 16.19 | 48 | 0.37 | 3 | bdl | 68 | 0.5 |
| bdl | 2.5 | 9.71 | 31 | 0.36 | 2 | bdl | 68 | 0.3 |
| bdl | 2.0 | 19.72 | 13 | 0.24 | 5 | bdl | 55 | 0.2 |
| bdl | 11.9 | 76.66 | 20 | 0.43 | 7 | bdl | 70 | 0.8 |
| bdl | 8.9 | 31.78 | 16 | 0.43 | 7 | bdl | 80 | 0.8 |
| bdl | 5.2 | 19.15 | 41 | 0.40 | 4 | bdl | 69 | 0.4 |
| bdl | 2.1 | 11.05 | 41 | 0.31 | 3 | bdl | 72 | 0.4 |
| bdl | 1.8 | 15.70 | 16 | 0.22 | 4 | bdl | 53 | 0.2 |

| Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
| --- | --- | --- | --- |
| HCl Extraction | | | |
| 0.7 | bdl | 1.2 | 0.9 |
| 1.8 | bdl | 1.5 | 0.5 |
| 2.2 | bdl | 1.7 | 1.1 |
| 1.4 | bdl | 0.9 | 2.3 |
| 0.1 | 0.2 | 0.1 | 0.7 |
| bdl | 0.2 | 0.1 | 2.2 |
| bdl | 0.1 | 0.1 | 11.9 |
| bdl | 0.1 | 0.1 | 5.5 |
| bdl | 0.1 | 0.1 | 1.4 |
| bdl | 0.1 | 0.1 | 12.4 |
| 0.6 | bdl | 0.1 | 0.2 |
| 0.9 | bdl | 0.2 | 0.2 |
| 0.5 | bdl | 0.2 | 0.2 |
| 0.1 | bdl | 0.1 | 1.4 |
| 0.7 | bdl | 0.1 | 0.2 |
| 0.7 | bdl | 0.1 | 0.2 |
| 0.1 | bdl | 0.2 | 0.1 |
| 0.1 | bdl | 0.2 | 1.8 |
| 5.6 | bdl | 1.1 | 1.3 |
| 2.8 | bdl | 0.7 | 1.0 |
| 3.5 | bdl | 0.4 | 0.7 |
| 2.8 | bdl | 0.3 | 0.6 |
| 2.5 | bdl | 0.2 | 0.5 |
| 4.1 | bdl | 1.0 | 1.4 |
| 3.1 | bdl | 0.9 | 1.4 |
| 3.5 | bdl | 0.6 | 0.9 |
| 2.9 | bdl | 0.3 | 0.6 |
| 2.2 | bdl | 0.2 | 0.5 |

# APPENDIX F. GEOCHEMISTRY OF SMALL COLUMN EXPERIMENTS

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) |
|---|---|---|---|---|---|
| Raglan control | 1 | bdl | bdl | bdl | bdl |
| Raglan control | 2 | bdl | bdl | bdl | bdl |
| Raglan control | 3 | bdl | bdl | 0.01 | bdl |
| Raglan control | 4 | bdl | bdl | 0.01 | bdl |
| Raglan control | 5 | bdl | bdl | 0.01 | bdl |
| Raglan control | 6 | bdl | bdl | bdl | bdl |
| Raglan control | 7 | bdl | bdl | 0.00 | bdl |
| Raglan control | 8 | bdl | bdl | bdl | bdl |
| Raglan control | 9 | bdl | bdl | bdl | bdl |
| Raglan control | 10 | bdl | bdl | bdl | bdl |
| Raglan control | 11 | bdl | bdl | bdl | bdl |
| Raglan control | 12 | bdl | bdl | bdl | bdl |
| Raglan control | 13 | bdl | bdl | bdl | bdl |
| Raglan mixed culture | 1 | bdl | bdl | 0.01 | bdl |
| Raglan mixed culture | 2 | bdl | bdl | 0.00 | bdl |
| Raglan mixed culture | 3 | bdl | bdl | bdl | bdl |
| Raglan mixed culture | 4 | bdl | bdl | bdl | bdl |
| Raglan mixed culture | 5 | bdl | bdl | bdl | bdl |
| Raglan mixed culture | 6 | bdl | bdl | 0.00 | bdl |
| Raglan mixed culture | 7 | bdl | bdl | 0.00 | bdl |
| Raglan mixed culture | 8 | bdl | bdl | 0.00 | bdl |
| Raglan mixed culture | 9 | bdl | bdl | 0.01 | bdl |
| Raglan mixed culture | 10 | bdl | bdl | 0.00 | bdl |
| Raglan mixed culture | 11 | bdl | bdl | 0.00 | bdl |
| Raglan mixed culture | 12 | bdl | bdl | 0.00 | bdl |
| Raglan mixed culture | 13 | bdl | bdl | bdl | bdl |
| Arrieros/LB control | 1 | bdl | bdl | 0.07 | bdl |
| Arrieros/LB control | 2 | bdl | bdl | 0.07 | bdl |
| Arrieros/LB control | 3 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB control | 4 | bdl | bdl | 0.06 | bdl |
| Arrieros/LB control | 5 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB control | 6 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 7 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 8 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 9 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 10 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 11 | bdl | bdl | bdl | bdl |
| Arrieros/LB control | 12 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 13 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (w/meth) | 1 | bdl | bdl | 0.09 | bdl |
| Arrieros/LB mixed culture (w/meth) | 2 | bdl | bdl | 0.06 | bdl |
| Arrieros/LB mixed culture (w/meth) | 3 | bdl | bdl | 0.00 | bdl |
| Arrieros/LB mixed culture (w/meth) | 4 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (w/meth) | 5 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (w/meth) | 6 | bdl | bdl | 0.00 | bdl |
| Arrieros/LB mixed culture (w/meth) | 7 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (w/meth) | 8 | bdl | bdl | 0.02 | bdl |

| B (ppm) | Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.34 | 0.38 | 159 | bdl | 1.07 | bdl | 0.033 | 0.39 | 13 |
| 0.44 | 0.31 | 163 | bdl | 1.08 | bdl | 0.031 | 0.25 | 13 |
| 0.45 | 0.28 | 61 | bdl | 0.45 | bdl | 0.020 | 0.87 | 8 |
| 0.51 | 1.05 | 43 | bdl | 0.30 | bdl | 0.007 | 1.68 | 7 |
| 0.33 | 1.45 | 13 | bdl | 0.12 | bdl | 0.003 | 5.38 | 6 |
| 0.21 | 1.07 | 13 | bdl | 0.09 | bdl | 0.000 | 6.30 | 14 |
| 0.17 | 0.59 | 15 | bdl | 0.09 | bdl | 0.003 | 15.22 | 21 |
| 0.24 | 1.24 | 7 | bdl | 0.03 | bdl | 0.001 | 5.07 | 6 |
| 0.06 | 0.03 | 9 | bdl | 0.02 | bdl | 0.018 | 3.88 | 12 |
| 0.13 | 0.29 | 7 | bdl | 0.01 | bdl | 0.000 | 1.72 | 9 |
| 0.06 | 0.08 | 8 | bdl | 0.00 | bdl | 0.006 | 1.86 | 23 |
| 0.06 | 0.02 | 6 | bdl | 0.00 | bdl | 0.000 | 3.46 | 12 |
| 0.07 | 0.04 | 11 | bdl | 0.00 | bdl | bdl | 2.48 | 16 |
| 0.41 | 1.44 | 68 | bdl | 0.12 | bdl | 0.044 | 0.30 | 13 |
| 0.15 | 0.49 | 64 | bdl | 0.12 | bdl | 0.031 | 0.24 | 12 |
| 0.34 | 1.38 | 68 | bdl | 0.14 | bdl | 0.018 | 0.74 | 27 |
| 0.73 | 0.80 | 182 | bdl | 0.86 | bdl | 0.005 | 13.29 | 40 |
| 0.41 | 1.39 | 21 | bdl | 0.12 | bdl | 0.002 | 3.42 | 10 |
| 0.23 | 1.30 | 13 | bdl | 0.07 | bdl | 0.003 | 1.85 | 14 |
| 0.08 | 0.35 | 7 | bdl | 0.04 | bdl | 0.005 | 1.57 | 9 |
| 0.26 | 1.42 | 7 | bdl | 0.03 | bdl | 0.005 | 3.63 | 6 |
| 0.02 | 0.03 | 9 | bdl | 0.03 | bdl | 0.022 | 2.37 | 13 |
| 0.06 | 0.30 | 8 | bdl | 0.02 | bdl | 0.002 | 3.04 | 8 |
| 0.03 | 0.03 | 10 | bdl | 0.02 | bdl | 0.006 | 3.45 | 16 |
| 0.07 | 0.03 | 7 | bdl | 0.01 | bdl | 0.004 | 0.76 | 12 |
| 0.07 | 0.03 | 11 | bdl | 0.02 | bdl | 0.000 | 1.95 | 18 |
| 5.28 | 0.18 | 200 | bdl | 0.00 | bdl | 0.004 | bdl | Sat |
| 4.73 | 0.16 | 230 | bdl | bdl | bdl | 0.004 | bdl | Sat |
| 3.04 | 0.16 | 252 | bdl | bdl | bdl | 0.006 | bdl | 40 |
| 1.85 | 0.65 | 238 | bdl | bdl | bdl | 0.002 | bdl | 34 |
| 0.52 | 1.25 | 34 | bdl | bdl | bdl | 0.000 | bdl | 13 |
| 0.39 | 1.06 | 54 | bdl | bdl | bdl | 0.000 | bdl | 21 |
| 0.20 | 0.27 | 22 | bdl | bdl | bdl | 0.000 | bdl | 14 |
| 0.31 | 1.07 | 17 | bdl | bdl | bdl | bdl | bdl | 11 |
| 0.13 | 0.01 | 27 | bdl | bdl | bdl | 0.014 | bdl | 18 |
| 0.13 | 0.21 | 18 | bdl | bdl | bdl | bdl | bdl | 15 |
| 0.09 | 0.01 | 29 | bdl | bdl | bdl | 0.000 | bdl | 24 |
| 0.08 | 0.05 | 16 | bdl | bdl | bdl | bdl | bdl | 17 |
| 0.09 | 0.04 | 38 | bdl | bdl | bdl | bdl | bdl | 32 |
| 5.21 | 0.24 | 250 | bdl | bdl | bdl | 0.004 | bdl | Sat |
| 3.99 | 0.17 | 349 | bdl | bdl | bdl | 0.003 | bdl | Sat |
| 1.70 | 0.29 | 202 | bdl | bdl | bdl | 0.014 | bdl | 27 |
| 1.21 | 0.46 | 175 | bdl | bdl | bdl | 0.005 | bdl | 25 |
| 0.50 | 0.93 | 79 | bdl | bdl | bdl | 0.002 | bdl | 20 |
| 0.36 | 1.06 | 62 | bdl | bdl | bdl | 0.002 | bdl | 24 |
| 0.21 | 0.28 | 27 | bdl | bdl | bdl | 0.002 | bdl | 15 |
| 0.33 | 1.20 | 17 | bdl | bdl | bdl | 0.000 | bdl | 11 |

| Li (ppm) | Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| 0.05 | 154.1 | 22.88 | 0.01 | 22 | 25.86 | bdl | 0.01 | 380 | bdl |
| 0.05 | 155.2 | 25.19 | 0.01 | 23 | 23.96 | bdl | 0.01 | 398 | bdl |
| 0.03 | 63.6 | 10.92 | 0.01 | 26 | 10.07 | bdl | 0.01 | 132 | bdl |
| 0.02 | 45.5 | 8.02 | 0.00 | 50 | 6.38 | bdl | 0.01 | 72 | bdl |
| 0.01 | 13.5 | 2.81 | 0.00 | 39 | 3.41 | 0.09 | bdl | 28 | bdl |
| 0.01 | 13.9 | 2.48 | 0.00 | 40 | 3.02 | 0.01 | 0.01 | 28 | bdl |
| 0.01 | 15.5 | 2.94 | 0.00 | 47 | 3.21 | 0.20 | bdl | 27 | bdl |
| 0.01 | 6.5 | 1.20 | 0.00 | 23 | 1.09 | 0.08 | bdl | 10 | bdl |
| 0.01 | 8.9 | 1.75 | bdl | 24 | 0.95 | bdl | bdl | 16 | bdl |
| 0.00 | 5.4 | 1.01 | bdl | 18 | 0.38 | 0.07 | 0.01 | 9 | bdl |
| 0.00 | 8.4 | 1.19 | bdl | 23 | 0.25 | 0.01 | bdl | 18 | bdl |
| 0.00 | 6.2 | 1.09 | bdl | 17 | 0.18 | 0.10 | 0.01 | 10 | bdl |
| 0.01 | 11.5 | 2.29 | bdl | 29 | 0.13 | bdl | 0.01 | 16 | bdl |
| 0.03 | 78.6 | 7.10 | 0.00 | 32 | 1.94 | 0.14 | bdl | 159 | bdl |
| 0.02 | 74.7 | 7.62 | 0.00 | 21 | 1.73 | 0.05 | 0.01 | 159 | bdl |
| 0.02 | 74.5 | 8.80 | 0.01 | 62 | 2.34 | bdl | 0.01 | 157 | bdl |
| 0.04 | 186.6 | 30.01 | 0.01 | 69 | 35.92 | bdl | bdl | 484 | bdl |
| 0.02 | 25.5 | 3.75 | 0.00 | 35 | 3.33 | 0.01 | bdl | 49 | bdl |
| 0.02 | 14.8 | 1.83 | 0.00 | 39 | 2.39 | 0.02 | bdl | 21 | bdl |
| 0.00 | 8.1 | 1.13 | 0.00 | 20 | 1.68 | 0.01 | bdl | 10 | bdl |
| 0.01 | 7.7 | 0.98 | 0.00 | 25 | 1.38 | 0.02 | 0.01 | 11 | bdl |
| 0.00 | 8.6 | 1.28 | bdl | 22 | 1.17 | bdl | 0.01 | 13 | bdl |
| 0.00 | 7.9 | 1.31 | bdl | 18 | 0.90 | 0.02 | bdl | 9 | bdl |
| 0.00 | 9.7 | 1.61 | bdl | 23 | 0.68 | bdl | 0.01 | 14 | bdl |
| 0.01 | 6.6 | 1.12 | bdl | 17 | 0.65 | 0.03 | 0.01 | 18 | bdl |
| 0.01 | 10.6 | 1.55 | bdl | 27 | 0.67 | 0.02 | bdl | 16 | bdl |
| 0.46 | 7.0 | 0.01 | 0.12 | 1330 | bdl | bdl | 0.02 | 559 | bdl |
| 0.37 | 5.9 | 0.00 | 0.13 | 702 | bdl | bdl | 0.01 | 441 | bdl |
| 0.28 | 6.1 | 0.00 | 0.10 | 265 | bdl | bdl | 0.02 | 265 | bdl |
| 0.22 | 5.7 | 0.01 | 0.09 | 165 | bdl | bdl | 0.01 | 193 | bdl |
| 0.11 | 1.2 | 0.02 | 0.13 | 39 | bdl | bdl | 0.01 | 20 | bdl |
| 0.12 | 2.2 | 0.00 | 0.08 | 46 | bdl | bdl | bdl | 25 | bdl |
| 0.06 | 0.9 | 0.00 | 0.08 | 24 | bdl | 0.01 | bdl | 9 | bdl |
| 0.04 | 1.1 | 0.00 | 0.06 | 24 | bdl | bdl | bdl | 7 | bdl |
| 0.05 | 1.5 | 0.00 | 0.04 | 25 | bdl | bdl | 0.01 | 14 | bdl |
| 0.04 | 1.0 | 0.00 | 0.02 | 18 | bdl | 0.02 | bdl | 8 | bdl |
| 0.04 | 2.2 | 0.00 | 0.03 | 28 | bdl | bdl | 0.01 | 20 | bdl |
| 0.02 | 1.5 | 0.00 | 0.02 | 16 | bdl | 0.03 | 0.01 | 6 | bdl |
| 0.04 | 4.5 | 0.00 | 0.01 | 31 | bdl | bdl | 0.01 | 20 | bdl |
| 0.41 | 6.4 | 0.00 | 0.14 | 873 | bdl | bdl | 0.01 | 506 | bdl |
| 0.35 | 6.8 | 0.00 | 0.14 | 439 | bdl | bdl | 0.01 | 443 | bdl |
| 0.19 | 6.9 | 0.08 | 0.11 | 136 | bdl | bdl | 0.01 | 165 | bdl |
| 0.15 | 7.1 | 0.06 | 0.08 | 109 | bdl | bdl | 0.01 | 123 | bdl |
| 0.12 | 2.8 | 0.07 | 0.08 | 40 | bdl | 0.04 | bdl | 60 | bdl |
| 0.10 | 3.1 | 0.05 | 0.05 | 43 | bdl | 0.05 | 0.01 | 32 | bdl |
| 0.06 | 0.9 | 0.02 | 0.05 | 24 | bdl | 0.06 | 0.01 | 13 | bdl |
| 0.04 | 0.7 | 0.01 | 0.03 | 23 | bdl | 0.05 | bdl | 6 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.07 | 16.1 | 0.16 | bdl | bdl | bdl | 0.75 |
| 0.06 | 19.4 | 0.16 | bdl | bdl | bdl | 0.57 |
| 0.04 | 18.0 | 0.06 | bdl | bdl | bdl | 0.29 |
| 0.03 | 16.9 | 0.05 | bdl | bdl | bdl | 0.32 |
| bdl | 15.6 | 0.04 | bdl | bdl | 0.01 | 0.25 |
| bdl | 9.9 | 0.04 | bdl | bdl | bdl | 0.26 |
| 0.01 | 19.0 | 0.03 | bdl | bdl | bdl | 0.29 |
| bdl | 10.3 | 0.03 | bdl | bdl | bdl | 0.22 |
| bdl | 9.4 | 0.02 | bdl | bdl | bdl | 0.06 |
| bdl | 7.4 | 0.01 | bdl | bdl | bdl | 0.17 |
| bdl | 7.8 | 0.01 | bdl | bdl | bdl | 0.09 |
| bdl | 9.4 | 0.01 | bdl | bdl | bdl | 0.02 |
| bdl | 9.9 | 0.02 | bdl | bdl | bdl | 0.03 |
| 0.03 | 11.7 | 0.10 | bdl | bdl | bdl | 1.06 |
| 0.02 | 12.7 | 0.08 | bdl | bdl | bdl | 0.23 |
| 0.05 | 8.4 | 0.08 | bdl | bdl | bdl | 0.11 |
| 0.09 | 18.8 | 0.18 | bdl | bdl | bdl | 0.79 |
| 0.00 | 16.6 | 0.05 | bdl | bdl | 0.01 | 0.31 |
| 0.01 | 7.1 | 0.04 | bdl | bdl | bdl | 0.13 |
| bdl | 6.0 | 0.01 | bdl | bdl | bdl | 0.14 |
| 0.01 | 7.9 | 0.03 | bdl | bdl | bdl | 0.13 |
| bdl | 5.1 | 0.01 | bdl | bdl | bdl | 0.03 |
| bdl | 6.4 | 0.02 | bdl | bdl | bdl | 0.14 |
| bdl | 7.1 | 0.02 | bdl | bdl | bdl | 0.03 |
| 0.01 | 6.2 | 0.01 | bdl | bdl | bdl | 0.02 |
| bdl | 9.2 | 0.02 | bdl | bdl | bdl | 0.03 |
| 0.06 | 11.5 | 0.51 | bdl | bdl | bdl | 0.12 |
| 0.08 | 13.1 | 0.48 | bdl | bdl | bdl | 0.08 |
| 0.06 | 13.5 | 0.46 | bdl | bdl | bdl | 0.09 |
| 0.06 | 13.9 | 0.42 | bdl | bdl | bdl | 0.06 |
| 0.01 | 11.9 | 0.15 | bdl | bdl | 0.01 | 0.03 |
| 0.02 | 10.6 | 0.25 | bdl | bdl | bdl | 0.03 |
| 0.02 | 9.4 | 0.10 | bdl | bdl | bdl | 0.07 |
| bdl | 8.2 | 0.09 | bdl | bdl | bdl | 0.01 |
| 0.01 | 8.2 | 0.13 | bdl | bdl | bdl | 0.01 |
| bdl | 7.6 | 0.09 | bdl | bdl | bdl | 0.04 |
| 0.02 | 7.4 | 0.16 | bdl | bdl | bdl | 0.01 |
| 0.01 | 5.4 | 0.09 | bdl | bdl | 0.01 | 0.02 |
| 0.01 | 5.9 | 0.24 | bdl | bdl | bdl | 0.02 |
| 0.05 | 12.7 | 0.53 | bdl | bdl | bdl | 0.09 |
| 0.07 | 14.9 | 0.61 | bdl | bdl | bdl | 0.08 |
| 0.06 | 9.5 | 0.45 | bdl | bdl | bdl | 0.11 |
| 0.04 | 9.0 | 0.42 | bdl | bdl | bdl | 0.05 |
| 0.01 | 8.5 | 0.34 | bdl | bdl | bdl | 0.07 |
| 0.01 | 8.4 | 0.27 | bdl | bdl | bdl | 0.07 |
| 0.01 | 8.7 | 0.11 | bdl | bdl | bdl | 0.06 |
| bdl | 7.3 | 0.09 | bdl | bdl | bdl | 0.01 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) |
|---|---|---|---|---|---|
| Arrieros/LB mixed culture (w/meth) | 9 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (w/meth) | 10 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (w/meth) | 11 | bdl | bdl | bdl | bdl |
| Arrieros/LB mixed culture (w/meth) | 12 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (w/meth) | 13 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB control | 1 | bdl | bdl | 0.06 | bdl |
| Arrieros/LB control | 2 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB control | 3 | bdl | bdl | 0.07 | bdl |
| Arrieros/LB control | 4 | bdl | bdl | 0.07 | bdl |
| Arrieros/LB control | 5 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB control | 6 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB control | 7 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB control | 8 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB control | 9 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB control | 10 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB control | 11 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB control | 12 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB control | 13 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB control | 14 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 15 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB control | 16 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB control | 17 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 18 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB control | 19 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 20 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB control | 21 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB control | 22 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 1 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB mixed culture (no meth) | 2 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (no meth) | 3 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB mixed culture (no meth) | 4 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 5 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (no meth) | 6 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 7 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB mixed culture (no meth) | 8 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (no meth) | 9 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 10 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 11 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (no meth) | 12 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 13 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (no meth) | 14 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 15 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 16 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 17 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB mixed culture (no meth) | 18 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB mixed culture (no meth) | 19 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB mixed culture (no meth) | 20 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB mixed culture (no meth) | 21 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB mixed culture (no meth) | 22 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB S-oxidizer only | 1 | bdl | bdl | 0.06 | bdl |
| Arrieros/LB S-oxidizer only | 2 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB S-oxidizer only | 3 | bdl | bdl | 0.06 | bdl |
| Arrieros/LB S-oxidizer only | 4 | bdl | bdl | 0.04 | bdl |

| B (ppm) | Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.11 | 0.02 | 25 | bdl | bdl | bdl | 0.005 | bdl | 20 |
| 0.12 | 0.24 | 18 | bdl | bdl | bdl | 0.002 | bdl | 16 |
| 0.08 | 0.02 | 25 | bdl | bdl | bdl | bdl | bdl | 21 |
| 0.08 | 0.01 | 19 | bdl | bdl | bdl | 0.000 | bdl | 19 |
| 0.09 | 0.03 | 47 | bdl | bdl | bdl | 0.001 | bdl | 32 |
| 5.53 | 0.02 | 227 | bdl | bdl | bdl | 0.007 | bdl | Sat |
| 4.35 | 0.02 | 174 | bdl | bdl | bdl | 0.022 | bdl | Sat |
| 3.31 | 0.02 | 175 | bdl | bdl | bdl | 0.010 | bdl | Sat |
| 2.98 | 0.02 | 228 | bdl | bdl | bdl | 0.006 | bdl | Sat |
| 2.74 | 0.02 | 253 | bdl | bdl | bdl | 0.015 | bdl | Sat |
| 2.07 | 0.02 | 284 | bdl | bdl | bdl | 0.011 | bdl | 36 |
| 1.69 | 0.02 | 289 | bdl | bdl | bdl | 0.010 | bdl | 31 |
| 1.52 | 0.02 | 264 | bdl | bdl | bdl | 0.011 | bdl | 29 |
| 1.31 | 0.01 | 186 | bdl | bdl | bdl | 0.008 | bdl | 23 |
| 1.22 | 0.01 | 129 | bdl | bdl | bdl | 0.010 | bdl | 21 |
| 1.26 | 0.01 | 100 | bdl | bdl | bdl | 0.015 | bdl | 21 |
| 0.99 | 0.01 | 66 | bdl | bdl | bdl | 0.009 | bdl | 16 |
| 0.90 | 0.01 | 55 | bdl | bdl | bdl | 0.002 | bdl | 15 |
| 0.95 | 0.02 | 61 | bdl | bdl | bdl | 0.008 | bdl | 17 |
| 0.71 | 0.01 | 45 | bdl | bdl | bdl | 0.005 | bdl | 19 |
| 0.65 | 0.01 | 40 | bdl | bdl | bdl | 0.001 | bdl | 20 |
| 0.61 | 0.01 | 33 | bdl | bdl | bdl | 0.006 | bdl | 20 |
| 0.55 | 0.01 | 29 | bdl | bdl | bdl | 0.003 | bdl | 19 |
| 0.54 | 0.01 | 28 | bdl | bdl | bdl | 0.002 | bdl | 19 |
| 0.54 | 0.01 | 29 | bdl | bdl | bdl | 0.002 | bdl | 20 |
| 0.64 | 0.04 | 35 | bdl | bdl | bdl | 0.017 | bdl | 22 |
| 0.45 | 0.01 | 24 | bdl | bdl | bdl | 0.008 | bdl | 16 |
| 3.81 | 0.03 | 163 | bdl | bdl | bdl | 0.017 | bdl | 30 |
| 2.77 | 0.03 | 95 | bdl | bdl | bdl | 0.020 | bdl | 18 |
| 2.39 | 0.02 | 109 | bdl | bdl | bdl | 0.010 | bdl | 21 |
| 1.70 | 0.02 | 92 | bdl | bdl | bdl | 0.015 | bdl | 17 |
| 1.71 | 0.03 | 130 | bdl | bdl | bdl | 0.019 | bdl | 25 |
| 1.32 | 0.02 | 115 | bdl | bdl | bdl | 0.011 | bdl | 26 |
| 1.19 | 0.02 | 124 | bdl | bdl | bdl | 0.009 | bdl | 27 |
| 1.15 | 0.02 | 138 | bdl | bdl | bdl | 0.009 | bdl | 26 |
| 0.93 | 0.03 | 116 | bdl | bdl | bdl | 0.021 | bdl | 26 |
| 0.93 | 0.01 | 117 | bdl | bdl | bdl | 0.011 | bdl | 28 |
| 0.85 | 0.01 | 104 | bdl | bdl | bdl | 0.015 | bdl | 32 |
| 0.71 | 0.01 | 91 | bdl | bdl | bdl | 0.010 | bdl | 28 |
| 0.62 | 0.01 | 79 | bdl | bdl | bdl | 0.003 | bdl | 28 |
| 0.69 | 0.02 | 107 | bdl | bdl | bdl | 0.006 | bdl | Sat |
| 0.60 | 0.02 | 91 | bdl | bdl | bdl | 0.003 | bdl | 35 |
| 0.55 | 0.03 | 72 | bdl | bdl | bdl | 0.010 | bdl | 34 |
| 0.40 | 0.01 | 45 | bdl | bdl | bdl | 0.005 | bdl | 30 |
| 0.40 | 0.02 | 66 | bdl | bdl | bdl | 0.002 | bdl | 31 |
| 0.48 | 0.01 | 79 | bdl | bdl | bdl | 0.004 | bdl | 28 |
| 0.41 | 0.02 | 54 | bdl | bdl | bdl | 0.007 | bdl | 26 |
| 0.43 | 0.01 | 52 | bdl | bdl | bdl | 0.004 | bdl | Sat |
| 0.33 | 0.01 | 31 | bdl | bdl | bdl | bdl | bdl | 15 |
| 5.38 | 0.02 | 282 | bdl | bdl | bdl | 0.011 | bdl | Sat |
| 4.44 | 0.02 | 244 | bdl | bdl | bdl | 0.079 | bdl | Sat |
| 3.70 | 0.02 | 263 | bdl | bdl | bdl | 0.014 | bdl | Sat |
| 2.64 | 0.02 | 254 | bdl | bdl | bdl | 0.010 | bdl | 38 |

| Li (ppm) | Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| 0.05 | 1.1 | 0.02 | 0.02 | 25 | bdl | 0.02 | 0.01 | 12 | bdl |
| 0.03 | 0.9 | 0.01 | 0.01 | 19 | bdl | 0.04 | 0.01 | 7 | bdl |
| 0.03 | 1.6 | 0.03 | 0.02 | 26 | bdl | 0.02 | 0.01 | 14 | bdl |
| 0.03 | 1.5 | 0.02 | 0.03 | 19 | bdl | 0.03 | bdl | 9 | bdl |
| 0.05 | 3.6 | 0.05 | 0.02 | 30 | bdl | bdl | 0.01 | 21 | bdl |
| 1.06 | 10.4 | 0.00 | 0.17 | 926 | bdl | bdl | 0.02 | 419 | bdl |
| 0.65 | 5.8 | 0.01 | 0.23 | 468 | bdl | bdl | bdl | 292 | bdl |
| 0.56 | 5.2 | 0.00 | 0.17 | 365 | bdl | bdl | 0.01 | 269 | bdl |
| 0.60 | 6.5 | 0.00 | 0.13 | 358 | bdl | bdl | 0.01 | 319 | bdl |
| 0.63 | 6.6 | 0.00 | 0.12 | 280 | bdl | bdl | 0.01 | 291 | bdl |
| 0.48 | 6.1 | 0.00 | 0.09 | 175 | bdl | bdl | 0.01 | 276 | bdl |
| 0.40 | 4.8 | 0.00 | 0.08 | 119 | bdl | bdl | 0.01 | 256 | bdl |
| 0.35 | 3.7 | 0.00 | 0.09 | 95 | bdl | bdl | bdl | 224 | bdl |
| 0.29 | 2.6 | 0.00 | 0.10 | 70 | bdl | bdl | bdl | 152 | bdl |
| 0.26 | 2.0 | 0.00 | 0.12 | 61 | bdl | bdl | bdl | 103 | bdl |
| 0.27 | 1.8 | 0.00 | 0.14 | 59 | bdl | bdl | bdl | 76 | bdl |
| 0.20 | 1.4 | 0.00 | 0.12 | 43 | bdl | bdl | bdl | 46 | bdl |
| 0.17 | 1.2 | 0.00 | 0.12 | 39 | bdl | bdl | bdl | 35 | bdl |
| 0.19 | 1.5 | 0.01 | 0.12 | 41 | bdl | bdl | bdl | 24 | bdl |
| 0.16 | 1.5 | 0.00 | 0.10 | 36 | bdl | bdl | 0.01 | 16 | bdl |
| 0.15 | 1.5 | 0.00 | 0.10 | 34 | bdl | bdl | bdl | 15 | bdl |
| 0.13 | 1.5 | 0.00 | 0.12 | 29 | bdl | bdl | bdl | 14 | bdl |
| 0.11 | 1.4 | 0.00 | 0.12 | 26 | bdl | bdl | bdl | 12 | bdl |
| 0.11 | 1.4 | 0.00 | 0.12 | 25 | bdl | bdl | bdl | 12 | bdl |
| 0.12 | 1.5 | 0.00 | 0.12 | 25 | bdl | bdl | bdl | 12 | bdl |
| 0.29 | 3.8 | 0.10 | 0.12 | 29 | bdl | bdl | 0.01 | 13 | bdl |
| 0.14 | 1.4 | 0.02 | 0.11 | 21 | bdl | bdl | bdl | 10 | bdl |
| 0.75 | 6.9 | 0.09 | 0.14 | 328 | bdl | bdl | 0.01 | 239 | bdl |
| 0.57 | 4.8 | 0.07 | 0.12 | 187 | bdl | bdl | 0.01 | 132 | bdl |
| 0.54 | 4.1 | 0.01 | 0.10 | 168 | bdl | bdl | 0.01 | 139 | bdl |
| 0.48 | 5.0 | 0.06 | 0.08 | 103 | bdl | bdl | bdl | 100 | bdl |
| 0.49 | 6.9 | 0.06 | 0.08 | 89 | bdl | bdl | 0.01 | 108 | bdl |
| 0.34 | 6.4 | 0.01 | 0.08 | 62 | bdl | bdl | bdl | 88 | bdl |
| 0.29 | 5.6 | 0.00 | 0.08 | 60 | bdl | bdl | bdl | 97 | bdl |
| 0.30 | 5.1 | 0.00 | 0.10 | 62 | bdl | bdl | bdl | 110 | bdl |
| 0.36 | 6.2 | 0.10 | 0.10 | 50 | bdl | bdl | 0.01 | 90 | bdl |
| 0.27 | 4.5 | 0.00 | 0.11 | 51 | bdl | bdl | bdl | 94 | bdl |
| 0.24 | 4.4 | 0.00 | 0.11 | 45 | bdl | bdl | bdl | 80 | bdl |
| 0.20 | 3.8 | 0.01 | 0.10 | 36 | bdl | bdl | 0.01 | 67 | bdl |
| 0.16 | 3.4 | 0.00 | 0.10 | 31 | bdl | bdl | 0.03 | 55 | bdl |
| 0.19 | 4.9 | 0.01 | 0.09 | 38 | bdl | bdl | bdl | 60 | bdl |
| 0.19 | 4.4 | 0.00 | 0.09 | 39 | bdl | bdl | bdl | 56 | bdl |
| 0.21 | 4.5 | 0.07 | 0.12 | 36 | bdl | bdl | 0.14 | 48 | bdl |
| 0.11 | 2.9 | 0.02 | 0.13 | 26 | bdl | bdl | bdl | 28 | bdl |
| 0.11 | 3.1 | 0.00 | 0.12 | 25 | bdl | bdl | bdl | 49 | bdl |
| 0.14 | 2.8 | 0.00 | 0.14 | 27 | bdl | bdl | bdl | 56 | bdl |
| 0.15 | 2.6 | 0.03 | 0.14 | 22 | bdl | bdl | bdl | 31 | bdl |
| 0.14 | 2.3 | 0.01 | 0.14 | 23 | bdl | bdl | bdl | 29 | bdl |
| 0.10 | 1.3 | 0.01 | 0.11 | 16 | bdl | bdl | bdl | 16 | bdl |
| 1.14 | 12.4 | 0.01 | 0.11 | 762 | bdl | bdl | 0.04 | 439 | bdl |
| 0.86 | 9.7 | 0.01 | 0.15 | 472 | bdl | bdl | 0.06 | 357 | bdl |
| 0.82 | 9.4 | 0.01 | 0.16 | 401 | bdl | bdl | 0.01 | 361 | bdl |
| 0.59 | 7.5 | 0.00 | 0.15 | 220 | bdl | bdl | 0.01 | 279 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| bdl | 6.5 | 0.12 | bdl | bdl | bdl | 0.05 |
| bdl | 5.7 | 0.08 | bdl | bdl | 0.01 | 0.12 |
| bdl | 5.5 | 0.12 | bdl | bdl | bdl | 0.02 |
| bdl | 4.6 | 0.09 | bdl | bdl | bdl | 0.01 |
| 0.02 | 5.6 | 0.24 | bdl | bdl | bdl | 0.03 |
| 0.03 | 17.3 | 1.51 | bdl | bdl | 0.02 | 0.02 |
| 0.02 | 17.9 | 0.86 | bdl | bdl | 0.03 | 0.02 |
| 0.01 | 17.4 | 0.83 | bdl | bdl | 0.03 | 0.03 |
| 0.03 | 17.4 | 1.05 | bdl | bdl | 0.03 | 0.01 |
| 0.03 | 20.3 | 1.12 | bdl | bdl | 0.06 | 0.00 |
| 0.03 | 19.5 | 1.06 | bdl | bdl | 0.04 | 0.01 |
| 0.02 | 19.4 | 0.96 | bdl | bdl | 0.05 | 0.00 |
| 0.02 | 20.5 | 0.81 | bdl | bdl | 0.05 | 0.01 |
| 0.03 | 20.2 | 0.55 | bdl | bdl | 0.04 | 0.00 |
| bdl | 20.8 | 0.40 | bdl | bdl | 0.05 | 0.01 |
| bdl | 23.3 | 0.34 | bdl | bdl | 0.07 | 0.02 |
| 0.01 | 20.4 | 0.22 | bdl | bdl | 0.05 | 0.01 |
| bdl | 19.7 | 0.18 | bdl | bdl | 0.02 | 0.01 |
| 0.01 | 22.0 | 0.19 | bdl | bdl | 0.03 | 0.07 |
| bdl | 17.8 | 0.20 | bdl | bdl | 0.02 | 0.03 |
| 0.01 | 17.1 | 0.19 | bdl | bdl | 0.01 | 0.02 |
| bdl | 17.3 | 0.17 | bdl | bdl | 0.02 | 0.03 |
| bdl | 16.1 | 0.15 | bdl | bdl | 0.01 | 0.05 |
| bdl | 16.3 | 0.15 | bdl | bdl | 0.02 | 0.02 |
| bdl | 16.3 | 0.16 | bdl | bdl | 0.02 | 0.04 |
| bdl | 27.7 | 0.18 | bdl | bdl | 0.02 | 0.02 |
| bdl | 15.9 | 0.11 | bdl | bdl | 0.03 | 0.01 |
| 0.02 | 23.1 | 0.79 | bdl | bdl | 0.02 | 0.03 |
| 0.01 | 18.9 | 0.44 | bdl | bdl | 0.03 | 0.06 |
| 0.01 | 14.5 | 0.54 | bdl | bdl | 0.03 | 0.02 |
| 0.02 | 19.0 | 0.44 | bdl | bdl | 0.03 | 0.02 |
| 0.02 | 20.3 | 0.69 | bdl | bdl | 0.05 | 0.01 |
| 0.03 | 16.6 | 0.67 | bdl | bdl | 0.04 | 0.01 |
| 0.01 | 16.1 | 0.63 | bdl | bdl | 0.04 | 0.01 |
| bdl | 17.2 | 0.62 | bdl | bdl | 0.04 | 0.00 |
| 0.02 | 23.5 | 0.53 | bdl | bdl | 0.04 | 0.02 |
| bdl | 19.2 | 0.55 | bdl | bdl | 0.05 | 0.01 |
| 0.01 | 20.2 | 0.51 | bdl | bdl | 0.06 | 0.01 |
| 0.02 | 18.8 | 0.42 | bdl | bdl | 0.04 | 0.01 |
| 0.01 | 18.9 | 0.37 | bdl | bdl | 0.01 | 0.03 |
| 0.03 | 20.9 | 0.51 | bdl | bdl | 0.02 | 0.02 |
| 0.01 | 19.4 | 0.50 | bdl | bdl | 0.02 | 0.02 |
| 0.01 | 22.2 | 0.39 | bdl | bdl | 0.01 | 0.06 |
| bdl | 18.9 | 0.26 | bdl | bdl | 0.01 | 0.02 |
| bdl | 17.6 | 0.35 | bdl | bdl | 0.01 | 0.03 |
| bdl | 19.2 | 0.34 | bdl | bdl | 0.02 | 0.01 |
| bdl | 19.6 | 0.25 | bdl | bdl | 0.02 | 0.04 |
| 0.01 | 19.0 | 0.25 | bdl | bdl | 0.02 | 0.02 |
| bdl | 13.2 | 0.15 | bdl | bdl | bdl | 0.01 |
| 0.03 | 16.9 | 1.81 | bdl | bdl | 0.01 | 0.12 |
| 0.04 | 17.4 | 1.36 | bdl | bdl | 0.02 | 0.17 |
| 0.01 | 17.3 | 1.46 | bdl | bdl | 0.03 | 0.04 |
| 0.03 | 17.1 | 1.18 | bdl | bdl | 0.03 | 0.01 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) |
|---|---|---|---|---|---|
| Arrieros/LB S-oxidizer only | 5 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB S-oxidizer only | 6 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB S-oxidizer only | 7 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB S-oxidizer only | 8 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB S-oxidizer only | 9 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB S-oxidizer only | 10 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB S-oxidizer only | 11 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB S-oxidizer only | 12 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB S-oxidizer only | 13 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB S-oxidizer only | 14 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB S-oxidizer only | 15 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB S-oxidizer only | 16 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB S-oxidizer only | 17 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB S-oxidizer only | 18 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB S-oxidizer only | 19 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB S-oxidizer only | 20 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB S-oxidizer only | 21 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB S-oxidizer only | 22 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB methanotroph only | 1 | bdl | bdl | 0.07 | bdl |
| Arrieros/LB methanotroph only | 2 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB methanotroph only | 3 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB methanotroph only | 4 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB methanotroph only | 5 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB methanotroph only | 6 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB methanotroph only | 7 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB methanotroph only | 8 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB methanotroph only | 9 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB methanotroph only | 10 | bdl | bdl | 0.03 | bdl |
| Arrieros/LB methanotroph only | 11 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB methanotroph only | 12 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB methanotroph only | 13 | bdl | bdl | 0.01 | bdl |
| Arrieros/LB methanotroph only | 14 | bdl | bdl | 0.00 | bdl |
| Arrieros/LB methanotroph only | 15 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB methanotroph only | 16 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB methanotroph only | 17 | bdl | bdl | 0.05 | bdl |
| Arrieros/LB methanotroph only | 18 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB methanotroph only | 19 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB methanotroph only | 20 | bdl | bdl | 0.04 | bdl |
| Arrieros/LB methanotroph only | 21 | bdl | bdl | 0.02 | bdl |
| Arrieros/LB methanotroph only | 22 | bdl | bdl | 0.02 | bdl |
| Talbot/T7 control 1 | 1 | bdl | bdl | bdl | bdl |
| Talbot/T7 control 1 | 2 | bdl | bdl | bdl | bdl |
| Talbot/T7 control 1 | 3 | bdl | 0.03 | bdl | bdl |
| Talbot/T7 control 1 | 4 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 1 | 5 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 6 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 7 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 1 | 8 | bdl | 0.03 | bdl | bdl |
| Talbot/T7 control 1 | 9 | bdl | 0.03 | bdl | bdl |
| Talbot/T7 control 1 | 10 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 1 | 11 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 12 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 13 | bdl | 0.00 | bdl | bdl |

| B (ppm) | Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) |
|---|---|---|---|---|---|---|---|---|
| 1.76 | 0.02 | 168 | bdl | bdl | bdl | 0.014 | bdl | 27 |
| 1.60 | 0.02 | 230 | bdl | bdl | bdl | 0.011 | bdl | 30 |
| 1.45 | 0.02 | 296 | bdl | bdl | bdl | 0.009 | bdl | 30 |
| 1.23 | 0.01 | 246 | bdl | bdl | bdl | 0.011 | bdl | 29 |
| 0.93 | 0.01 | 115 | bdl | bdl | bdl | 0.009 | bdl | 28 |
| 0.91 | 0.02 | 155 | bdl | bdl | bdl | 0.011 | bdl | 29 |
| 0.96 | 0.02 | 168 | bdl | bdl | bdl | 0.015 | bdl | 30 |
| 0.76 | 0.01 | 104 | bdl | bdl | bdl | 0.010 | bdl | 23 |
| 0.70 | 0.01 | 76 | bdl | bdl | bdl | 0.004 | bdl | 21 |
| 0.71 | 0.01 | 81 | bdl | bdl | bdl | 0.003 | bdl | 24 |
| 0.57 | 0.01 | 58 | bdl | bdl | bdl | 0.002 | bdl | 24 |
| 0.55 | 0.01 | 48 | bdl | bdl | bdl | 0.002 | bdl | 23 |
| 0.49 | 0.01 | 34 | bdl | bdl | bdl | 0.006 | bdl | 25 |
| 0.43 | 0.01 | 31 | bdl | bdl | bdl | 0.005 | bdl | 22 |
| 0.44 | 0.01 | 33 | bdl | bdl | bdl | 0.003 | bdl | 19 |
| 0.43 | 0.01 | 33 | bdl | bdl | bdl | 0.005 | bdl | 17 |
| 0.43 | 0.01 | 33 | bdl | bdl | bdl | 0.012 | bdl | 18 |
| 0.41 | 0.01 | 30 | bdl | bdl | bdl | 0.006 | bdl | 19 |
| 7.60 | 0.02 | 332 | bdl | bdl | bdl | 0.022 | bdl | Sat |
| 5.55 | 0.02 | 238 | bdl | bdl | bdl | 0.017 | bdl | Sat |
| 4.44 | 0.02 | 185 | bdl | bdl | bdl | 0.014 | bdl | Sat |
| 3.82 | 0.01 | 155 | bdl | bdl | bdl | 0.012 | bdl | 46 |
| 2.90 | 0.01 | 147 | bdl | bdl | bdl | 0.017 | bdl | 37 |
| 2.19 | 0.01 | 132 | bdl | bdl | bdl | 0.012 | bdl | 33 |
| 1.69 | 0.01 | 130 | bdl | bdl | bdl | 0.009 | bdl | 31 |
| 1.46 | 0.01 | 130 | bdl | bdl | bdl | 0.012 | bdl | 31 |
| 1.31 | 0.01 | 127 | bdl | bdl | bdl | 0.008 | bdl | 31 |
| 1.14 | 0.01 | 116 | bdl | bdl | bdl | 0.011 | bdl | 33 |
| 1.06 | 0.01 | 116 | bdl | bdl | bdl | 0.015 | bdl | 33 |
| 0.96 | 0.01 | 111 | bdl | bdl | bdl | 0.013 | bdl | 33 |
| 0.86 | 0.01 | 111 | bdl | bdl | bdl | 0.005 | bdl | 31 |
| 0.82 | 0.02 | 140 | bdl | bdl | bdl | 0.006 | bdl | 35 |
| 0.83 | 0.02 | 198 | bdl | bdl | bdl | 0.004 | bdl | 34 |
| 0.78 | 0.02 | 195 | bdl | bdl | bdl | 0.003 | bdl | 29 |
| 0.60 | 0.01 | 84 | bdl | bdl | bdl | 0.009 | bdl | 20 |
| 0.55 | 0.01 | 75 | bdl | bdl | bdl | 0.005 | bdl | 17 |
| 0.49 | 0.01 | 63 | bdl | bdl | bdl | 0.004 | bdl | 17 |
| 0.48 | 0.01 | 59 | bdl | bdl | bdl | 0.005 | bdl | 17 |
| 0.45 | 0.01 | 56 | bdl | bdl | bdl | 0.005 | bdl | 20 |
| 0.45 | 0.01 | 51 | bdl | bdl | bdl | 0.008 | bdl | 20 |
| bdl | Sat | 561 | bdl | 0.01 | bdl | 0.010 | 0.01 | Sat |
| bdl | Sat | 455 | bdl | 0.00 | bdl | 0.007 | 0.00 | 27.3 |
| bdl | Sat | 57 | bdl | 0.00 | bdl | 0.013 | 0.11 | 11.2 |
| bdl | Sat | 46 | bdl | 0.00 | bdl | 0.012 | 0.00 | 11.9 |
| bdl | 0.02 | 32 | bdl | 0.00 | bdl | 0.003 | 0.01 | 8.9 |
| bdl | 0.02 | 25 | bdl | 0.00 | bdl | 0.002 | 0.01 | 9.5 |
| bdl | 1.21 | 23 | bdl | bdl | bdl | 0.005 | 0.06 | 5.9 |
| bdl | 1.08 | 19 | bdl | bdl | bdl | 0.002 | 0.05 | 5.1 |
| bdl | 0.93 | 16 | bdl | bdl | bdl | 0.003 | 0.10 | 5.5 |
| bdl | 0.01 | 15 | bdl | bdl | bdl | 0.000 | 0.01 | 9.1 |
| bdl | 0.01 | 22 | bdl | bdl | bdl | 0.003 | 0.00 | 7.0 |
| bdl | 0.01 | 19 | bdl | bdl | bdl | 0.003 | 0.01 | 6.1 |
| bdl | 0.01 | 20 | bdl | bdl | bdl | 0.002 | 0.02 | 5.7 |

| Li (ppm) | Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| 0.39 | 4.8 | 0.02 | 0.12 | 95 | bdl | bdl | bdl | 145 | bdl |
| 0.41 | 5.6 | 0.01 | 0.10 | 90 | bdl | bdl | bdl | 193 | bdl |
| 0.41 | 5.4 | 0.00 | 0.10 | 79 | bdl | bdl | 0.01 | 238 | bdl |
| 0.34 | 4.4 | 0.00 | 0.11 | 60 | bdl | bdl | bdl | 189 | bdl |
| 0.23 | 3.7 | 0.00 | 0.13 | 41 | bdl | bdl | bdl | 84 | bdl |
| 0.25 | 3.7 | 0.00 | 0.14 | 42 | bdl | bdl | bdl | 118 | bdl |
| 0.28 | 3.5 | 0.00 | 0.16 | 43 | bdl | bdl | bdl | 126 | bdl |
| 0.19 | 2.3 | 0.00 | 0.14 | 31 | bdl | bdl | bdl | 73 | bdl |
| 0.16 | 2.0 | 0.00 | 0.14 | 27 | bdl | bdl | 0.01 | 46 | bdl |
| 0.18 | 2.3 | 0.01 | 0.12 | 30 | bdl | bdl | bdl | 36 | bdl |
| 0.15 | 2.0 | 0.00 | 0.10 | 29 | bdl | bdl | 0.03 | 21 | bdl |
| 0.15 | 1.8 | 0.00 | 0.12 | 29 | bdl | bdl | bdl | 19 | bdl |
| 0.12 | 1.8 | 0.01 | 0.13 | 27 | bdl | bdl | bdl | 15 | bdl |
| 0.11 | 1.4 | 0.00 | 0.12 | 24 | bdl | bdl | bdl | 14 | bdl |
| 0.12 | 1.3 | 0.01 | 0.12 | 24 | bdl | bdl | bdl | 13 | bdl |
| 0.14 | 1.1 | 0.00 | 0.12 | 25 | bdl | bdl | bdl | 12 | bdl |
| 0.14 | 1.1 | 0.00 | 0.12 | 24 | bdl | bdl | bdl | 12 | bdl |
| 0.13 | 1.2 | 0.00 | 0.12 | 23 | bdl | bdl | 0.01 | 11 | bdl |
| 1.75 | 22.3 | 0.01 | 0.10 | 1481 | bdl | bdl | 0.61 | 554 | bdl |
| 1.18 | 14.7 | 0.01 | 0.12 | 804 | bdl | bdl | 0.01 | 404 | bdl |
| 0.84 | 10.3 | 0.00 | 0.15 | 504 | bdl | bdl | 0.01 | 306 | bdl |
| 0.67 | 7.8 | 0.00 | 0.19 | 380 | bdl | bdl | 0.01 | 255 | bdl |
| 0.53 | 6.2 | 0.00 | 0.18 | 274 | bdl | bdl | bdl | 208 | bdl |
| 0.45 | 5.4 | 0.00 | 0.12 | 204 | bdl | bdl | bdl | 170 | bdl |
| 0.40 | 5.1 | 0.00 | 0.09 | 151 | bdl | bdl | bdl | 147 | bdl |
| 0.36 | 4.9 | 0.01 | 0.09 | 121 | bdl | bdl | bdl | 136 | bdl |
| 0.33 | 4.9 | 0.01 | 0.09 | 96 | bdl | bdl | bdl | 125 | bdl |
| 0.28 | 4.7 | 0.00 | 0.10 | 76 | bdl | bdl | bdl | 109 | bdl |
| 0.27 | 4.6 | 0.00 | 0.10 | 66 | bdl | bdl | bdl | 104 | bdl |
| 0.25 | 4.5 | 0.01 | 0.10 | 57 | bdl | bdl | bdl | 96 | bdl |
| 0.22 | 4.2 | 0.00 | 0.09 | 49 | bdl | bdl | 0.01 | 88 | bdl |
| 0.23 | 5.1 | 0.01 | 0.08 | 51 | bdl | bdl | bdl | 98 | bdl |
| 0.26 | 5.2 | 0.00 | 0.08 | 53 | bdl | bdl | 0.01 | 152 | bdl |
| 0.24 | 4.1 | 0.00 | 0.09 | 44 | bdl | bdl | bdl | 149 | bdl |
| 0.17 | 1.9 | 0.00 | 0.11 | 30 | bdl | bdl | bdl | 55 | bdl |
| 0.16 | 1.6 | 0.00 | 0.11 | 28 | bdl | bdl | bdl | 48 | bdl |
| 0.14 | 1.5 | 0.00 | 0.10 | 26 | bdl | bdl | bdl | 38 | bdl |
| 0.15 | 1.6 | 0.00 | 0.10 | 25 | bdl | bdl | bdl | 34 | bdl |
| 0.14 | 1.8 | 0.00 | 0.09 | 24 | bdl | bdl | bdl | 31 | bdl |
| 0.14 | 1.8 | 0.00 | 0.11 | 23 | bdl | bdl | 0.02 | 29 | bdl |
| bdl | 61.4 | 1.26 | 0.006 | Sat | 0.17 | bdl | 0.01 | 419 | bdl |
| bdl | 50.4 | 0.78 | 0.007 | Sat | 0.01 | bdl | 0.01 | 319 | bdl |
| bdl | 20.1 | 0.49 | 0.005 | Sat | 0.00 | bdl | 0.01 | 19 | bdl |
| bdl | 16.9 | 0.05 | 0.003 | Sat | 0.00 | bdl | 0.00 | 17 | bdl |
| bdl | 10.9 | 0.02 | 0.004 | Sat | 0.00 | bdl | 0.01 | 14 | bdl |
| bdl | 9.4 | 0.13 | 0.001 | Sat | 0.00 | bdl | 0.00 | 14 | bdl |
| bdl | 9.3 | 0.05 | 0.003 | 25 | 0.00 | bdl | 0.01 | 11 | bdl |
| bdl | 8.3 | 0.42 | 0.003 | 22 | 0.00 | bdl | 0.01 | 11 | bdl |
| bdl | 6.7 | 0.28 | 0.002 | 20 | 0.00 | bdl | 0.01 | 9 | bdl |
| bdl | 6.3 | 0.06 | 0.002 | Sat | 0.00 | bdl | 0.00 | 8 | bdl |
| bdl | 9.4 | 0.10 | 0.002 | 16 | 0.00 | 0.00 | 0.00 | 15 | bdl |
| bdl | 8.1 | 0.12 | 0.003 | Sat | bdl | 0.00 | bdl | 9 | bdl |
| bdl | 8.6 | 0.20 | 0.002 | 15 | 0.00 | 0.01 | bdl | 10 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.03 | 16.3 | 0.69 | bdl | bdl | 0.04 | bdl |
| 0.02 | 16.6 | 0.92 | bdl | bdl | 0.04 | bdl |
| 0.03 | 18.2 | 1.03 | bdl | bdl | 0.04 | 0.00 |
| 0.03 | 18.5 | 0.83 | bdl | bdl | 0.04 | 0.00 |
| 0.01 | 16.3 | 0.52 | bdl | bdl | 0.04 | 0.00 |
| 0.03 | 16.9 | 0.60 | bdl | bdl | 0.04 | 0.00 |
| 0.03 | 19.4 | 0.62 | bdl | bdl | 0.06 | 0.01 |
| 0.01 | 17.1 | 0.38 | bdl | bdl | 0.04 | 0.01 |
| 0.01 | 17.7 | 0.30 | bdl | bdl | 0.02 | 0.02 |
| bdl | 18.8 | 0.32 | bdl | bdl | 0.02 | 0.02 |
| bdl | 16.5 | 0.27 | bdl | bdl | 0.02 | 0.02 |
| bdl | 17.2 | 0.23 | bdl | bdl | 0.01 | 0.03 |
| bdl | 17.3 | 0.19 | bdl | bdl | 0.02 | 0.02 |
| bdl | 16.2 | 0.16 | bdl | bdl | 0.02 | 0.04 |
| 0.01 | 17.5 | 0.15 | bdl | bdl | 0.02 | 0.01 |
| bdl | 17.3 | 0.15 | bdl | bdl | 0.02 | 0.03 |
| bdl | 16.9 | 0.15 | bdl | bdl | 0.02 | 0.02 |
| bdl | 17.1 | 0.14 | bdl | bdl | 0.04 | 0.05 |
| 0.02 | 18.7 | 3.01 | bdl | bdl | 0.01 | 0.04 |
| 0.03 | 17.6 | 1.89 | bdl | bdl | 0.03 | 0.00 |
| 0.03 | 17.1 | 1.30 | bdl | bdl | 0.03 | 0.04 |
| 0.02 | 16.7 | 0.99 | bdl | bdl | 0.03 | 0.01 |
| 0.02 | 16.4 | 0.79 | bdl | bdl | 0.04 | bdl |
| 0.01 | 16.2 | 0.69 | bdl | bdl | 0.04 | bdl |
| 0.02 | 16.7 | 0.64 | bdl | bdl | 0.03 | 0.00 |
| 0.01 | 17.6 | 0.62 | bdl | bdl | 0.04 | 0.00 |
| 0.01 | 18.6 | 0.61 | bdl | bdl | 0.03 | 0.00 |
| 0.01 | 18.8 | 0.56 | bdl | bdl | 0.04 | 0.01 |
| 0.01 | 19.6 | 0.55 | bdl | bdl | 0.06 | 0.01 |
| 0.01 | 19.7 | 0.53 | bdl | bdl | 0.05 | 0.01 |
| 0.01 | 19.5 | 0.50 | bdl | bdl | 0.02 | 0.02 |
| bdl | 20.5 | 0.59 | bdl | bdl | 0.01 | 0.04 |
| 0.02 | 19.4 | 0.74 | bdl | bdl | 0.01 | 0.03 |
| 0.02 | 20.0 | 0.66 | bdl | bdl | 0.01 | 0.01 |
| bdl | 20.5 | 0.29 | bdl | bdl | 0.02 | 0.02 |
| bdl | 19.9 | 0.25 | bdl | bdl | 0.02 | 0.02 |
| bdl | 19.3 | 0.22 | bdl | bdl | 0.02 | 0.03 |
| 0.02 | 18.9 | 0.22 | bdl | bdl | 0.02 | 0.01 |
| bdl | 18.8 | 0.23 | bdl | bdl | 0.02 | 0.03 |
| 0.02 | 19.3 | 0.22 | bdl | bdl | 0.03 | 0.03 |
| 0.10 | 5.4 | 0.74 | bdl | bdl | bdl | 3.43 |
| 0.08 | 6.5 | 0.62 | bdl | bdl | bdl | 2.61 |
| 0.03 | 3.4 | 0.09 | bdl | bdl | bdl | 0.09 |
| 0.03 | 3.0 | 0.07 | bdl | bdl | bdl | 0.07 |
| 0.03 | 2.0 | 0.05 | bdl | bdl | bdl | 0.05 |
| 0.02 | 1.6 | 0.04 | bdl | bdl | bdl | 0.04 |
| 0.02 | 1.7 | 0.05 | bdl | bdl | bdl | 0.11 |
| 0.02 | 1.5 | 0.04 | bdl | bdl | bdl | 0.08 |
| 0.03 | 1.3 | 0.03 | bdl | bdl | bdl | 0.04 |
| 0.00 | 0.9 | 0.02 | bdl | bdl | bdl | 0.01 |
| 0.00 | 1.2 | 0.02 | bdl | bdl | bdl | 0.01 |
| 0.04 | 1.3 | 0.02 | bdl | bdl | bdl | 0.01 |
| 0.01 | 1.5 | 0.02 | bdl | bdl | bdl | 0.01 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) |
|---|---|---|---|---|---|
| Talbot/T7 control 1 | 14 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 15 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 16 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 1 | 17 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 18 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 1 | 19 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 1 | 20 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 1 | bdl | 0.05 | bdl | bdl |
| Talbot/T7 control 2 | 2 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 3 | bdl | 0.03 | bdl | bdl |
| Talbot/T7 control 2 | 4 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 5 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 2 | 6 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 2 | 7 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 2 | 8 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 2 | 9 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 2 | 10 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 2 | 11 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 12 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 2 | 13 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 14 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 15 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 2 | 16 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 17 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 18 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 2 | 19 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 2 | 20 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 3 | 1 | bdl | 0.31 | bdl | bdl |
| Talbot/T7 control 3 | 2 | bdl | bdl | bdl | bdl |
| Talbot/T7 control 3 | 3 | bdl | bdl | bdl | bdl |
| Talbot/T7 control 3 | 4 | bdl | bdl | bdl | bdl |
| Talbot/T7 control 3 | 5 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 3 | 6 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 3 | 7 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 3 | 8 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 3 | 9 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 control 3 | 10 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 3 | 11 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 3 | 12 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 control 3 | 13 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 control 3 | 14 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 1 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 2 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 3 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 4 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 5 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 6 | bdl | 0.00 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 7 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 8 | bdl | 0.02 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 9 | bdl | 0.03 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 10 | bdl | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 11 | bdl | 0.01 | bdl | bdl |
| Talbot/T7 mixed culture 1 | 12 | bdl | 0.01 | bdl | bdl |

| B (ppm) | Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) |
|---|---|---|---|---|---|---|---|---|
| bdl | 0.01 | 19 | bdl | bdl | bdl | 0.001 | 0.01 | 8.7 |
| bdl | 0.01 | 19 | bdl | bdl | bdl | 0.000 | 0.01 | 9.2 |
| bdl | 0.92 | 17 | bdl | bdl | bdl | 0.001 | 0.01 | 7.7 |
| bdl | 0.69 | 15 | bdl | bdl | bdl | 0.001 | 0.02 | 6.9 |
| bdl | 0.78 | 15 | bdl | bdl | bdl | 0.000 | 0.07 | 7.8 |
| bdl | 0.88 | 17 | bdl | bdl | bdl | bdl | 0.02 | 7.5 |
| bdl | 1.35 | 19 | bdl | bdl | bdl | bdl | 0.09 | 6.2 |
| bdl | Sat | 199 | bdl | 0.02 | bdl | 0.025 | 0.04 | 22.0 |
| bdl | Sat | 201 | bdl | 0.01 | bdl | 0.005 | 0.02 | 20.6 |
| bdl | Sat | 43 | bdl | 0.00 | bdl | 0.014 | 0.03 | 10.3 |
| bdl | Sat | 48 | bdl | 0.00 | bdl | 0.013 | 0.01 | 11.7 |
| bdl | 0.01 | 28 | bdl | 0.00 | bdl | 0.003 | 0.02 | 7.7 |
| bdl | 0.01 | 23 | bdl | bdl | bdl | 0.007 | 0.02 | 7.6 |
| bdl | 1.10 | 18 | bdl | bdl | bdl | 0.003 | 0.04 | 5.5 |
| bdl | 0.71 | 20 | bdl | bdl | bdl | 0.003 | 0.05 | 6.7 |
| bdl | 0.75 | 17 | bdl | bdl | bdl | 0.003 | 0.12 | 6.5 |
| bdl | 0.01 | 18 | bdl | bdl | bdl | bdl | 0.08 | 8.8 |
| bdl | 0.01 | 20 | bdl | bdl | bdl | 0.003 | 0.05 | 6.6 |
| bdl | 0.01 | 18 | bdl | bdl | bdl | 0.002 | 0.06 | 6.3 |
| bdl | 0.00 | 9 | bdl | bdl | bdl | bdl | 0.05 | 3.0 |
| bdl | 0.01 | 19 | bdl | bdl | bdl | 0.001 | 0.03 | 9.0 |
| bdl | Sat | 23 | bdl | bdl | bdl | 0.001 | 0.59 | 6.1 |
| bdl | 1.02 | 19 | bdl | bdl | bdl | 0.000 | 0.13 | 7.8 |
| bdl | 0.92 | 18 | bdl | bdl | bdl | bdl | 0.07 | 7.6 |
| bdl | 0.76 | 16 | bdl | bdl | bdl | 0.000 | 0.06 | 7.3 |
| bdl | 0.95 | 19 | bdl | bdl | bdl | 0.000 | 0.14 | 7.1 |
| bdl | Sat | 19 | bdl | bdl | bdl | 0.001 | 0.08 | 5.8 |
| bdl | Sat | 315 | bdl | 0.03 | bdl | 0.088 | 0.05 | Sat |
| bdl | Sat | 297 | bdl | 0.01 | bdl | 0.011 | 0.01 | Sat |
| bdl | Sat | 171 | bdl | 0.00 | bdl | 0.156 | 0.11 | 15.4 |
| bdl | Sat | 90 | bdl | 0.00 | bdl | 0.016 | 0.00 | 13.0 |
| bdl | 0.02 | 36 | bdl | bdl | bdl | 0.003 | 0.01 | 9.9 |
| bdl | 0.01 | 28 | bdl | bdl | bdl | 0.002 | 0.01 | 9.1 |
| bdl | 0.63 | 30 | bdl | bdl | bdl | 0.007 | 0.02 | 6.7 |
| bdl | 1.13 | 27 | bdl | bdl | bdl | 0.002 | 0.02 | 5.4 |
| bdl | 1.10 | 24 | bdl | bdl | bdl | 0.004 | 0.02 | 5.0 |
| bdl | 0.01 | 21 | bdl | bdl | bdl | 0.001 | 0.01 | 8.2 |
| bdl | 0.01 | 25 | bdl | bdl | bdl | 0.004 | 0.01 | 6.5 |
| bdl | 0.01 | 22 | bdl | bdl | bdl | 0.003 | 0.01 | 5.6 |
| bdl | 0.01 | 27 | bdl | bdl | bdl | 0.003 | 0.01 | 5.9 |
| bdl | 0.01 | 22 | bdl | bdl | bdl | 0.002 | 0.01 | 8.1 |
| bdl | Sat | 229 | bdl | 0.01 | bdl | 0.007 | 0.03 | 21.5 |
| bdl | Sat | 123 | bdl | 0.00 | bdl | 0.004 | 0.02 | 18.9 |
| bdl | Sat | 53 | bdl | 0.00 | bdl | 0.016 | 0.19 | 10.7 |
| bdl | Sat | 43 | bdl | 0.00 | bdl | 0.016 | 0.03 | 9.8 |
| bdl | 0.01 | 30 | bdl | bdl | bdl | 0.004 | 0.04 | 9.3 |
| bdl | 0.01 | 27 | bdl | bdl | bdl | 0.003 | 0.02 | 8.0 |
| bdl | 0.69 | 25 | bdl | bdl | bdl | 0.007 | 0.10 | 6.1 |
| bdl | 1.09 | 21 | bdl | bdl | bdl | 0.002 | 0.06 | 4.7 |
| bdl | 1.86 | 20 | bdl | bdl | bdl | 0.003 | 0.03 | 3.4 |
| bdl | 0.02 | 19 | bdl | bdl | bdl | 0.004 | 0.13 | 8.3 |
| bdl | 0.01 | 26 | bdl | bdl | bdl | 0.003 | 0.10 | 7.2 |
| bdl | 0.01 | 24 | bdl | bdl | bdl | 0.002 | 0.04 | 6.2 |

| Li (ppm) | Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| bdl | 7.3 | 0.19 | 0.003 | 16 | 0.00 | bdl | bdl | 8 | bdl |
| bdl | 6.1 | 0.10 | 0.003 | 16 | 0.00 | 0.01 | 0.00 | 10 | bdl |
| bdl | 5.6 | 0.10 | 0.002 | 19 | 0.00 | 0.00 | 0.00 | 9 | bdl |
| bdl | 5.3 | 0.09 | 0.002 | 23 | bdl | 0.02 | 0.00 | 6 | bdl |
| bdl | 5.4 | 0.07 | 0.002 | 25 | 0.00 | 0.01 | bdl | 7 | bdl |
| bdl | 6.9 | 0.20 | 0.002 | 25 | 0.00 | 0.02 | 0.00 | 9 | bdl |
| bdl | 7.6 | 0.26 | 0.001 | 27 | 0.00 | 0.07 | 0.00 | 10 | bdl |
| bdl | 69.7 | 4.48 | 0.007 | Sat | 0.19 | bdl | 0.01 | 199 | bdl |
| bdl | 47.0 | 1.73 | 0.005 | Sat | 0.01 | bdl | 0.01 | 155 | bdl |
| bdl | 16.4 | 0.26 | 0.002 | Sat | 0.00 | bdl | 0.01 | 15 | bdl |
| bdl | 19.8 | 0.02 | 0.005 | Sat | 0.00 | bdl | 0.01 | 28 | bdl |
| bdl | 11.8 | 0.00 | 0.002 | Sat | 0.00 | bdl | 0.01 | 12 | bdl |
| bdl | 10.5 | 0.00 | 0.001 | Sat | 0.00 | bdl | 0.01 | 10 | bdl |
| bdl | 8.0 | 0.09 | 0.002 | 24 | 0.00 | bdl | 0.00 | 8 | bdl |
| bdl | 7.4 | 0.13 | 0.003 | 20 | 0.00 | bdl | 0.00 | 11 | bdl |
| bdl | 6.1 | 0.15 | 0.002 | 19 | 0.00 | bdl | 0.01 | 8 | bdl |
| bdl | 6.4 | 0.19 | 0.002 | 17 | 0.00 | bdl | 0.01 | 10 | bdl |
| bdl | 7.3 | 0.31 | 0.002 | Sat | bdl | bdl | bdl | 10 | bdl |
| bdl | 6.9 | 0.28 | 0.002 | 16 | bdl | 0.00 | 0.01 | 10 | bdl |
| bdl | 3.9 | 0.28 | 0.000 | 7 | bdl | bdl | 0.01 | 5 | bdl |
| bdl | 7.7 | 0.45 | 0.002 | 16 | bdl | bdl | 0.00 | 8 | bdl |
| bdl | 9.8 | 0.66 | 0.004 | 24 | 0.00 | 0.02 | bdl | 9 | bdl |
| bdl | 7.7 | 0.36 | 0.003 | 20 | bdl | bdl | bdl | 10 | bdl |
| bdl | 6.2 | 0.26 | 0.003 | 26 | 0.00 | 0.01 | 0.00 | 9 | bdl |
| bdl | 6.1 | 0.32 | 0.001 | 25 | 0.00 | 0.02 | 0.00 | 8 | bdl |
| bdl | 6.8 | 0.34 | 0.000 | 26 | 0.00 | 0.02 | 0.00 | 9 | bdl |
| bdl | 7.5 | 0.42 | 0.002 | 28 | 0.00 | 0.01 | 0.01 | 11 | bdl |
| bdl | 105.4 | 8.84 | 0.006 | Sat | 0.21 | bdl | bdl | 316 | bdl |
| bdl | 65.1 | 2.13 | 0.006 | Sat | 0.01 | bdl | 0.01 | 234 | bdl |
| bdl | 32.4 | 0.93 | 0.006 | Sat | 0.01 | bdl | 0.01 | 111 | bdl |
| bdl | 28.8 | 0.33 | 0.004 | Sat | 0.01 | bdl | 0.01 | 50 | bdl |
| bdl | 13.2 | 0.01 | 0.003 | Sat | 0.00 | bdl | 0.01 | 17 | bdl |
| bdl | 11.1 | 0.00 | 0.002 | Sat | 0.00 | 0.00 | 0.01 | 13 | bdl |
| bdl | 10.1 | 0.01 | 0.004 | 22 | 0.00 | bdl | 0.01 | 11 | bdl |
| bdl | 9.8 | 0.02 | 0.005 | 23 | 0.00 | bdl | 0.01 | 11 | bdl |
| bdl | 8.8 | 0.03 | 0.002 | 20 | 0.00 | bdl | 0.00 | 10 | bdl |
| bdl | 7.8 | 0.02 | 0.003 | Sat | bdl | bdl | 0.00 | 9 | bdl |
| bdl | 10.5 | 0.06 | 0.003 | Sat | bdl | 0.01 | 0.00 | 16 | bdl |
| bdl | 9.4 | 0.03 | 0.003 | Sat | 0.00 | bdl | 0.00 | 10 | bdl |
| bdl | 11.7 | 0.01 | 0.003 | Sat | 0.00 | 0.01 | 0.00 | 25 | bdl |
| bdl | 9.4 | 1.56 | 0.003 | 16 | 0.00 | 0.00 | 0.00 | 12 | bdl |
| bdl | 73.6 | 4.53 | 0.006 | Sat | 0.01 | bdl | 0.02 | 217 | bdl |
| bdl | 48.8 | 0.99 | 0.005 | Sat | 0.01 | bdl | 0.01 | 101 | bdl |
| bdl | 22.9 | 0.64 | 0.006 | Sat | 0.00 | bdl | 0.00 | 16 | bdl |
| bdl | 20.2 | 0.15 | 0.003 | Sat | 0.01 | bdl | 0.00 | 11 | bdl |
| bdl | 14.1 | 0.07 | 0.004 | Sat | bdl | 0.01 | 0.00 | 9 | bdl |
| bdl | 12.4 | 0.03 | 0.002 | Sat | 0.00 | 0.00 | 0.01 | 8 | bdl |
| bdl | 11.9 | 0.02 | 0.005 | 22 | 0.00 | bdl | 0.01 | 7 | bdl |
| bdl | 9.5 | 0.06 | 0.004 | 23 | 0.00 | 0.00 | 0.00 | 7 | bdl |
| bdl | 8.9 | 0.09 | 0.003 | 24 | 0.00 | 0.01 | 0.00 | 7 | bdl |
| bdl | 8.7 | 1.04 | 0.003 | 17 | 0.00 | bdl | 0.00 | 7 | bdl |
| bdl | 12.0 | 0.70 | 0.003 | Sat | bdl | 0.01 | 0.00 | 24 | bdl |
| bdl | 8.8 | 0.50 | 0.004 | Sat | 0.00 | 0.00 | 0.01 | 11 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| bdl | 1.2 | 0.03 | bdl | bdl | bdl | 0.01 |
| 0.01 | 0.9 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.00 | 0.9 | 0.02 | bdl | bdl | bdl | 0.04 |
| bdl | 0.7 | 0.02 | bdl | bdl | bdl | 0.07 |
| bdl | 0.7 | 0.02 | bdl | bdl | bdl | 0.04 |
| bdl | 1.0 | 0.02 | bdl | bdl | bdl | 0.06 |
| 0.01 | 1.2 | 0.02 | bdl | bdl | bdl | 0.09 |
| 0.06 | 3.8 | 0.32 | bdl | bdl | bdl | 0.51 |
| 0.04 | 4.1 | 0.29 | bdl | bdl | bdl | 0.30 |
| 0.03 | 2.5 | 0.07 | bdl | bdl | bdl | 0.03 |
| 0.02 | 2.8 | 0.08 | bdl | bdl | bdl | 0.02 |
| 0.01 | 1.9 | 0.05 | bdl | bdl | bdl | 0.05 |
| 0.00 | 1.7 | 0.04 | bdl | bdl | bdl | 0.03 |
| 0.00 | 1.2 | 0.04 | bdl | bdl | bdl | 0.10 |
| 0.02 | 0.9 | 0.03 | bdl | bdl | bdl | 0.07 |
| 0.02 | 0.8 | 0.03 | bdl | bdl | bdl | 0.05 |
| 0.01 | 0.8 | 0.03 | bdl | bdl | bdl | 0.00 |
| bdl | 1.0 | 0.02 | bdl | bdl | bdl | 0.01 |
| 0.03 | 1.0 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.01 | 0.7 | 0.01 | bdl | bdl | bdl | 0.00 |
| bdl | 1.2 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.00 | 1.8 | 0.04 | bdl | bdl | bdl | 0.05 |
| 0.01 | 1.2 | 0.03 | bdl | bdl | bdl | 0.04 |
| bdl | 1.0 | 0.02 | bdl | bdl | bdl | 0.05 |
| bdl | 0.9 | 0.02 | bdl | bdl | bdl | 0.05 |
| 0.02 | 1.1 | 0.02 | bdl | bdl | bdl | 0.16 |
| 0.02 | 1.3 | 0.03 | bdl | bdl | bdl | 0.04 |
| 0.15 | 5.1 | 0.54 | bdl | bdl | bdl | 2.93 |
| 0.08 | 5.5 | 0.48 | bdl | bdl | bdl | 1.70 |
| 0.05 | 3.8 | 0.22 | bdl | bdl | bdl | 0.39 |
| 0.05 | 3.5 | 0.13 | bdl | bdl | bdl | 0.17 |
| 0.01 | 1.9 | 0.06 | bdl | bdl | bdl | 0.06 |
| 0.02 | 1.5 | 0.04 | bdl | bdl | bdl | 0.03 |
| 0.01 | 1.6 | 0.05 | bdl | bdl | bdl | 0.07 |
| 0.01 | 1.6 | 0.05 | bdl | bdl | bdl | 0.07 |
| bdl | 1.6 | 0.05 | bdl | bdl | bdl | 0.07 |
| 0.01 | 1.3 | 0.04 | bdl | bdl | bdl | 0.01 |
| 0.05 | 1.5 | 0.03 | bdl | bdl | bdl | 0.01 |
| 0.01 | 1.5 | 0.03 | bdl | bdl | bdl | 0.01 |
| 0.03 | 1.6 | 0.03 | bdl | bdl | bdl | 0.01 |
| 0.00 | 2.0 | 0.03 | bdl | bdl | bdl | 0.01 |
| 0.09 | 3.8 | 0.38 | bdl | bdl | bdl | 0.40 |
| 0.05 | 3.8 | 0.22 | bdl | bdl | bdl | 0.19 |
| 0.02 | 3.6 | 0.08 | bdl | bdl | bdl | 0.07 |
| 0.03 | 3.3 | 0.07 | bdl | bdl | bdl | 0.10 |
| 0.02 | 2.3 | 0.06 | bdl | bdl | bdl | 0.04 |
| 0.02 | 2.1 | 0.05 | bdl | bdl | bdl | 0.03 |
| 0.01 | 2.0 | 0.05 | bdl | bdl | bdl | 0.72 |
| 0.02 | 1.7 | 0.04 | bdl | bdl | bdl | 0.04 |
| 0.01 | 1.8 | 0.04 | bdl | bdl | bdl | 0.07 |
| 0.02 | 1.4 | 0.04 | bdl | bdl | bdl | 0.02 |
| 0.03 | 1.5 | 0.04 | bdl | bdl | bdl | 0.00 |
| 0.03 | 1.4 | 0.03 | bdl | bdl | bdl | 0.00 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 mixed culture 1 | 13 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 14 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 15 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 16 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 17 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 18 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 19 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 1 | 20 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 1 | bdl | 0.03 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 3 | bdl | 0.05 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 4 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 5 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 6 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 7 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 8 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 9 | bdl | 0.03 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 10 | bdl | 0.03 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 11 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 12 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 13 | bdl | 0.03 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 14 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 15 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 16 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 17 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 18 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 19 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 2 | 20 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 1 | bdl | 0.08 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 3 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 4 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 5 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 6 | bdl | 0.02 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 7 | bdl | 0.02 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 8 | bdl | 0.02 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 9 | bdl | 0.02 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 10 | bdl | 0.03 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 11 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 12 | bdl | 0.01 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 13 | bdl | 0.00 | bdl | bdl | bdl |
| Talbot/T7 mixed culture 3 | 14 | bdl | 0.02 | bdl | bdl | bdl |
| Arrieros/LB Ore control | 1 | bdl | bdl | bdl | bdl | 3.24 |
| Arrieros/LB Ore control | 2 | bdl | bdl | 0.013 | bdl | 2.41 |
| Arrieros/LB Ore control | 3 | bdl | bdl | 0.005 | bdl | 2.01 |
| Arrieros/LB Ore control | 4 | bdl | bdl | 0.012 | bdl | 1.52 |
| Arrieros/LB Ore control | 5 | bdl | bdl | 0.005 | bdl | 1.20 |
| Arrieros/LB Ore control | 6 | bdl | bdl | 0.002 | bdl | 0.98 |
| Arrieros/LB Ore control | 7 | bdl | bdl | 0.015 | bdl | 0.87 |
| Arrieros/LB Ore control | 8 | bdl | bdl | 0.015 | bdl | 0.72 |
| Arrieros/LB Ore control | 9 | bdl | bdl | 0.007 | bdl | 0.68 |
| Arrieros/LB Ore control | 10 | bdl | bdl | 0.007 | bdl | 0.65 |
| Arrieros/LB Ore control | 11 | bdl | bdl | 0.014 | bdl | 0.65 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.01 | 31 | bdl | bdl | bdl | 0.008 | 0.02 | 7.0 | bdl |
| 0.01 | 21 | bdl | bdl | bdl | 0.000 | 0.04 | 9.4 | bdl |
| 0.01 | 20 | bdl | bdl | bdl | 0.000 | 0.05 | 8.4 | bdl |
| 0.82 | 20 | bdl | bdl | bdl | bdl | 0.06 | 7.5 | bdl |
| 0.86 | 20 | bdl | bdl | bdl | 0.001 | 0.06 | 7.6 | bdl |
| 0.71 | 19 | bdl | bdl | bdl | bdl | 0.09 | 7.8 | bdl |
| 0.79 | 19 | bdl | bdl | bdl | 0.000 | 0.14 | 7.4 | bdl |
| Sat | 18 | bdl | bdl | bdl | 0.002 | 0.07 | 6.1 | bdl |
| Sat | 282 | bdl | 0.01 | bdl | 0.007 | 0.04 | Sat | bdl |
| Sat | 217 | bdl | 0.01 | bdl | 0.003 | 0.02 | 19.0 | bdl |
| Sat | 46 | bdl | 0.00 | bdl | 0.013 | 3.51 | 10.7 | bdl |
| Sat | 48 | bdl | 0.00 | bdl | 0.013 | 0.03 | 13.3 | bdl |
| 0.02 | 29 | bdl | 0.00 | bdl | 0.004 | 0.07 | 9.6 | bdl |
| 0.01 | 24 | bdl | 0.00 | bdl | 0.004 | 0.02 | 9.2 | bdl |
| 1.12 | 24 | bdl | bdl | bdl | 0.003 | 0.03 | 6.0 | bdl |
| 0.78 | 23 | bdl | bdl | bdl | 0.002 | 0.03 | 6.5 | bdl |
| 0.62 | 19 | bdl | bdl | bdl | 0.001 | 0.16 | 6.6 | bdl |
| 0.01 | 17 | bdl | bdl | bdl | 0.000 | 0.03 | 8.7 | bdl |
| 0.01 | 22 | bdl | bdl | bdl | 0.003 | 0.05 | 6.7 | bdl |
| 0.01 | 16 | bdl | bdl | bdl | 0.002 | 0.05 | 6.2 | bdl |
| 0.01 | 18 | bdl | bdl | bdl | 0.002 | 0.03 | 5.7 | bdl |
| 0.01 | 14 | bdl | bdl | bdl | 0.000 | 0.03 | 9.2 | bdl |
| 0.97 | 19 | bdl | bdl | bdl | 0.002 | 0.02 | 8.2 | bdl |
| 0.01 | 15 | bdl | bdl | bdl | 0.001 | 0.02 | 9.3 | bdl |
| 0.77 | 18 | bdl | bdl | bdl | 0.003 | 0.04 | 7.7 | bdl |
| 0.84 | 18 | bdl | bdl | bdl | bdl | 0.17 | 7.9 | bdl |
| 1.04 | 18 | bdl | bdl | bdl | bdl | 0.17 | 6.5 | bdl |
| 1.07 | 18 | bdl | bdl | bdl | bdl | 0.17 | 6.5 | bdl |
| Sat | 310 | bdl | 0.01 | bdl | 0.010 | 0.02 | Sat | bdl |
| Sat | 285 | bdl | 0.01 | bdl | 0.004 | 0.01 | 20.1 | bdl |
| Sat | 70 | bdl | 0.00 | bdl | 0.012 | 2.45 | 13.1 | bdl |
| Sat | 50 | bdl | 0.00 | bdl | 0.012 | 0.51 | 12.4 | bdl |
| 0.01 | 35 | bdl | bdl | bdl | 0.003 | 0.40 | 9.9 | bdl |
| 0.01 | 28 | bdl | bdl | bdl | 0.002 | 0.29 | 9.5 | bdl |
| 1.08 | 20 | bdl | bdl | bdl | 0.002 | 0.34 | 5.8 | bdl |
| 0.90 | 20 | bdl | bdl | bdl | 0.001 | 0.34 | 6.2 | bdl |
| 0.87 | 17 | bdl | bdl | bdl | bdl | 0.18 | 6.2 | bdl |
| 0.01 | 14 | bdl | bdl | bdl | bdl | 0.09 | 8.9 | bdl |
| 0.01 | 19 | bdl | bdl | bdl | 0.003 | 0.07 | 6.8 | bdl |
| 0.01 | 17 | bdl | bdl | bdl | 0.002 | 0.03 | 6.2 | bdl |
| 0.01 | 22 | bdl | bdl | bdl | 0.002 | 0.01 | 6.6 | bdl |
| 0.01 | 19 | bdl | bdl | bdl | 0.001 | 0.04 | 9.2 | bdl |
| 0.03 | 21 | 0.008 | bdl | bdl | 20.6 | bdl | Sat | 0.42 |
| 0.03 | 15 | 0.007 | bdl | bdl | 14.4 | bdl | Sat | 0.29 |
| 0.04 | 12 | 0.005 | bdl | bdl | 11.6 | bdl | Sat | 0.24 |
| 0.04 | 8 | 0.004 | bdl | bdl | 8.9 | bdl | Sat | 0.19 |
| 0.04 | 7 | 0.003 | bdl | bdl | 7.6 | bdl | Sat | 0.16 |
| 0.04 | 6 | 0.003 | bdl | bdl | 6.3 | bdl | Sat | 0.14 |
| 0.04 | 5 | 0.002 | bdl | bdl | 5.5 | bdl | Sat | 0.12 |
| 0.04 | 4 | 0.003 | bdl | bdl | 4.6 | bdl | Sat | 0.10 |
| 0.04 | 4 | 0.003 | bdl | bdl | 4.8 | bdl | Sat | 0.10 |
| 0.04 | 4 | 0.002 | bdl | bdl | 5.1 | bdl | Sat | 0.09 |
| 0.05 | 5 | 0.002 | bdl | bdl | 5.5 | bdl | 46 | 0.10 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 13.6 | 0.73 | 0.006 | 16 | 0.080 | bdl | 0.00 | 36 | bdl |
| 7.8 | 0.39 | 0.003 | 16 | 0.001 | 0.01 | 0.00 | 9 | bdl |
| 6.8 | 0.31 | 0.002 | 16 | bdl | 0.02 | 0.00 | 8 | bdl |
| 6.7 | 0.28 | 0.001 | 19 | bdl | 0.04 | 0.00 | 8 | bdl |
| 6.4 | 0.28 | 0.002 | 25 | 0.001 | 0.03 | 0.01 | 8 | bdl |
| 5.9 | 0.24 | 0.002 | 25 | 0.001 | 0.08 | 0.00 | 8 | bdl |
| 7.1 | 0.36 | 0.000 | 26 | 0.000 | 0.11 | 0.00 | 8 | bdl |
| 7.6 | 0.26 | 0.003 | 27 | 0.000 | 0.05 | 0.00 | 11 | bdl |
| 60.5 | 2.03 | 0.005 | Sat | 0.013 | bdl | 0.02 | 257 | bdl |
| 37.6 | 0.87 | 0.004 | Sat | 0.038 | bdl | 0.02 | 158 | bdl |
| 15.5 | 0.52 | 0.003 | Sat | 0.001 | bdl | 0.00 | 11 | bdl |
| 19.3 | 0.53 | 0.004 | Sat | 0.002 | bdl | 0.00 | 22 | bdl |
| 10.8 | 0.36 | 0.002 | Sat | 0.001 | 0.06 | 0.04 | 11 | bdl |
| 8.9 | 0.33 | 0.002 | Sat | 0.001 | 0.03 | 0.01 | 9 | bdl |
| 8.7 | 0.25 | 0.005 | 24 | 0.000 | 0.01 | 0.01 | 8 | bdl |
| 8.7 | 0.20 | 0.004 | 21 | 0.000 | 0.01 | 0.00 | 8 | bdl |
| 7.6 | 0.26 | 0.000 | 18 | 0.000 | 0.04 | 0.00 | 6 | bdl |
| 7.1 | 0.25 | 0.004 | 17 | bdl | 0.00 | 0.00 | 7 | bdl |
| 8.2 | 0.30 | 0.003 | 16 | 0.001 | 0.03 | 0.00 | 11 | bdl |
| 6.3 | 0.26 | 0.001 | Sat | 0.000 | 0.00 | 0.00 | 8 | bdl |
| 7.7 | 0.24 | 0.002 | Sat | bdl | 0.02 | 0.00 | 8 | bdl |
| 5.8 | 0.20 | 0.001 | 16 | 0.001 | bdl | 0.00 | 7 | bdl |
| 8.3 | 0.27 | 0.001 | 21 | bdl | 0.01 | 0.00 | 9 | bdl |
| 6.4 | 0.21 | 0.001 | 17 | 0.000 | bdl | 0.00 | 7 | bdl |
| 7.0 | 0.30 | 0.001 | 25 | bdl | 0.02 | 0.01 | 8 | bdl |
| 6.9 | 0.35 | 0.003 | 25 | 0.001 | 0.07 | 0.01 | 7 | bdl |
| 7.2 | 0.40 | 0.003 | 26 | 0.000 | 0.09 | 0.00 | 7 | bdl |
| 7.2 | 0.40 | 0.003 | 26 | 0.000 | 0.07 | 0.00 | 7 | bdl |
| 69.1 | 1.83 | 0.005 | Sat | 0.028 | bdl | 0.02 | 270 | bdl |
| 55.4 | 1.03 | 0.009 | Sat | 0.009 | bdl | 0.03 | 213 | bdl |
| 22.4 | 0.63 | 0.004 | Sat | 0.001 | bdl | 0.01 | 22 | bdl |
| 18.6 | 0.80 | 0.005 | Sat | 0.001 | bdl | 0.00 | 11 | bdl |
| 13.0 | 0.49 | 0.003 | Sat | 0.014 | 0.17 | 0.01 | 9 | bdl |
| 10.5 | 0.36 | 0.001 | Sat | 0.000 | 0.13 | 0.00 | 7 | bdl |
| 7.8 | 0.26 | 0.002 | 23 | bdl | 0.15 | 0.01 | 6 | bdl |
| 8.0 | 0.22 | 0.002 | 22 | bdl | 0.18 | 0.01 | 7 | bdl |
| 6.7 | 0.23 | 0.004 | 19 | bdl | 0.06 | 0.01 | 7 | bdl |
| 6.0 | 0.19 | 0.001 | 17 | 0.000 | 0.04 | 0.01 | 7 | bdl |
| 7.9 | 0.29 | 0.001 | 16 | 0.001 | 0.02 | 0.00 | 10 | bdl |
| 7.2 | 0.28 | 0.003 | 15 | 0.000 | 0.02 | 0.00 | 8 | bdl |
| 10.0 | 0.50 | 0.002 | Sat | 0.001 | 0.04 | 0.00 | 13 | bdl |
| 8.4 | 0.42 | 0.002 | 16 | 0.001 | 0.03 | 0.01 | 10 | bdl |
| 3.9 | 1.15 | 0.02 | 22 | 0.018 | bdl | 0.014 | 94 | bdl |
| 3.1 | 1.00 | 0.03 | 19 | 0.015 | bdl | 0.034 | 60 | bdl |
| 2.9 | 0.86 | 0.03 | 19 | 0.012 | bdl | 0.011 | 49 | bdl |
| 2.3 | 0.73 | 0.03 | 18 | 0.009 | bdl | 0.011 | 38 | bdl |
| 2.2 | 0.70 | 0.03 | 21 | 0.009 | bdl | 0.007 | 32 | bdl |
| 1.9 | 0.63 | 0.04 | 22 | 0.009 | bdl | 0.011 | 29 | bdl |
| 1.8 | 0.57 | 0.04 | 22 | 0.007 | bdl | 0.004 | 29 | bdl |
| 1.5 | 0.50 | 0.04 | 18 | 0.005 | bdl | bdl | 24 | bdl |
| 1.6 | 0.53 | 0.04 | 17 | 0.005 | bdl | 0.005 | 24 | bdl |
| 1.7 | 0.55 | 0.04 | 17 | 0.005 | bdl | 0.008 | 23 | bdl |
| 1.8 | 0.60 | 0.04 | 19 | 0.013 | bdl | 0.010 | 23 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.03 | 1.7 | 0.04 | bdl | bdl | bdl | 0.19 |
| 0.01 | 1.1 | 0.03 | bdl | bdl | bdl | 0.00 |
| bdl | 1.0 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.01 | 1.0 | 0.03 | bdl | bdl | bdl | 0.02 |
| bdl | 1.0 | 0.02 | bdl | bdl | bdl | 0.05 |
| 0.00 | 0.9 | 0.02 | bdl | bdl | bdl | 0.06 |
| bdl | 1.1 | 0.02 | bdl | bdl | bdl | 0.04 |
| 0.00 | 1.2 | 0.02 | bdl | bdl | bdl | 0.04 |
| 0.07 | 3.6 | 0.50 | bdl | bdl | bdl | 0.26 |
| 0.04 | 3.5 | 0.31 | bdl | bdl | bdl | 0.21 |
| 0.02 | 3.2 | 0.06 | bdl | bdl | bdl | 0.01 |
| 0.03 | 3.3 | 0.07 | bdl | bdl | bdl | 0.03 |
| bdl | 2.2 | 0.05 | bdl | bdl | bdl | 0.03 |
| 0.01 | 1.7 | 0.04 | bdl | bdl | bdl | 0.06 |
| 0.04 | 1.7 | 0.05 | bdl | bdl | bdl | 0.09 |
| 0.03 | 1.6 | 0.04 | bdl | bdl | bdl | 0.07 |
| 0.02 | 1.3 | 0.03 | bdl | bdl | bdl | 0.05 |
| 0.01 | 1.1 | 0.03 | bdl | bdl | bdl | 0.00 |
| 0.01 | 1.4 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.02 | 0.7 | 0.01 | bdl | bdl | bdl | 0.01 |
| 0.01 | 1.1 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.01 | 0.6 | 0.01 | bdl | bdl | bdl | 0.02 |
| 0.01 | 1.2 | 0.03 | bdl | bdl | bdl | 0.07 |
| 0.00 | 0.8 | 0.02 | bdl | bdl | bdl | 0.01 |
| bdl | 1.0 | 0.02 | bdl | bdl | bdl | 0.08 |
| 0.00 | 1.1 | 0.02 | bdl | bdl | bdl | 0.07 |
| 0.00 | 1.4 | 0.02 | bdl | bdl | bdl | 0.06 |
| bdl | 1.4 | 0.02 | bdl | bdl | bdl | 0.06 |
| 0.10 | 3.9 | 0.48 | bdl | bdl | bdl | 0.54 |
| 0.09 | 3.6 | 0.33 | bdl | bdl | bdl | 0.15 |
| 0.02 | 3.7 | 0.09 | bdl | bdl | bdl | 0.01 |
| 0.01 | 3.4 | 0.08 | bdl | bdl | bdl | 0.01 |
| bdl | 2.4 | 0.06 | bdl | bdl | bdl | 0.03 |
| 0.01 | 2.0 | 0.04 | bdl | bdl | bdl | 0.03 |
| 0.02 | 1.6 | 0.04 | bdl | bdl | bdl | 0.07 |
| 0.01 | 1.4 | 0.03 | bdl | bdl | bdl | 0.07 |
| 0.02 | 1.1 | 0.03 | bdl | bdl | bdl | 0.05 |
| 0.04 | 0.8 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.01 | 1.1 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.02 | 0.9 | 0.02 | bdl | bdl | bdl | 0.00 |
| 0.01 | 1.2 | 0.02 | bdl | bdl | bdl | 0.01 |
| 0.02 | 1.0 | 0.02 | bdl | bdl | bdl | 0.01 |
| 0.024 | 27.9 | 0.34 | bdl | bdl | 0.09 | 0.80 |
| 0.007 | 32.6 | 0.24 | bdl | bdl | 0.01 | 0.63 |
| bdl | 34.4 | 0.21 | bdl | bdl | 0.04 | 0.49 |
| 0.004 | 33.0 | 0.17 | bdl | bdl | 0.04 | 0.39 |
| bdl | 33.8 | 0.15 | bdl | bdl | 0.03 | 0.35 |
| bdl | 33.3 | 0.13 | bdl | bdl | 0.03 | 0.30 |
| bdl | 34.5 | 0.12 | bdl | bdl | 0.04 | 0.27 |
| 0.003 | 31.5 | 0.10 | bdl | bdl | 0.02 | 0.23 |
| 0.003 | 32.4 | 0.11 | bdl | bdl | 0.03 | 0.25 |
| bdl | 32.9 | 0.11 | bdl | bdl | 0.04 | 0.26 |
| 0.012 | 34.9 | 0.12 | bdl | bdl | 0.05 | 0.29 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Arrieros/LB Ore control | 12 | bdl | bdl | 0.004 | bdl | 0.56 |
| Arrieros/LB Ore control | 13 | bdl | bdl | bdl | bdl | 0.50 |
| Arrieros/LB Ore control | 14 | bdl | bdl | bdl | bdl | 0.51 |
| Arrieros/LB Ore control | 15 | bdl | bdl | 0.005 | bdl | 0.42 |
| Arrieros/LB Ore control | 16 | bdl | bdl | 0.001 | bdl | 0.41 |
| Arrieros/LB Ore control | 17 | bdl | bdl | bdl | bdl | 0.36 |
| Arrieros/LB Ore control | 18 | bdl | bdl | 0.004 | bdl | 0.29 |
| Arrieros/LB Ore control | 19 | bdl | bdl | bdl | bdl | 0.28 |
| Arrieros/LB Ore control | 20 | bdl | bdl | 0.004 | bdl | 0.29 |
| Arrieros/LB Ore control | 21 | bdl | bdl | 0.006 | bdl | 0.27 |
| Arrieros/LB Ore control | 22 | bdl | bdl | 0.007 | bdl | 0.25 |
| Arrieros/LB Ore mixed culture | 1 | bdl | bdl | bdl | bdl | 5.03 |
| Arrieros/LB Ore mixed culture | 2 | bdl | bdl | 0.012 | bdl | 2.83 |
| Arrieros/LB Ore mixed culture | 3 | bdl | bdl | 0.009 | bdl | 2.35 |
| Arrieros/LB Ore mixed culture | 4 | bdl | bdl | 0.005 | bdl | 1.83 |
| Arrieros/LB Ore mixed culture | 5 | bdl | bdl | 0.011 | bdl | 1.25 |
| Arrieros/LB Ore mixed culture | 6 | bdl | bdl | bdl | bdl | 0.91 |
| Arrieros/LB Ore mixed culture | 7 | bdl | bdl | 0.007 | bdl | 0.69 |
| Arrieros/LB Ore mixed culture | 8 | bdl | bdl | bdl | bdl | 0.53 |
| Arrieros/LB Ore mixed culture | 9 | bdl | bdl | 0.005 | bdl | 0.44 |
| Arrieros/LB Ore mixed culture | 10 | bdl | bdl | 0.004 | bdl | 0.37 |
| Arrieros/LB Ore mixed culture | 11 | bdl | bdl | bdl | bdl | 0.32 |
| Arrieros/LB Ore mixed culture | 12 | bdl | bdl | bdl | bdl | 0.26 |
| Arrieros/LB Ore mixed culture | 13 | bdl | bdl | bdl | bdl | 0.35 |
| Arrieros/LB Ore mixed culture | 14 | bdl | bdl | 0.001 | bdl | 0.28 |
| Arrieros/LB Ore mixed culture | 15 | bdl | bdl | 0.006 | bdl | 0.31 |
| Arrieros/LB Ore mixed culture | 16 | bdl | bdl | bdl | bdl | 0.29 |
| Arrieros/LB Ore mixed culture | 17 | bdl | bdl | 0.000 | bdl | 0.35 |
| Arrieros/LB Ore mixed culture | 18 | bdl | bdl | 0.001 | bdl | 0.31 |
| Arrieros/LB Ore mixed culture | 19 | bdl | bdl | bdl | bdl | 0.29 |
| Arrieros/LB Ore mixed culture | 20 | bdl | bdl | 0.007 | bdl | 0.29 |
| Arrieros/LB Ore mixed culture | 21 | bdl | bdl | 0.011 | bdl | 0.26 |
| Arrieros/LB Ore mixed culture | 22 | bdl | bdl | 0.004 | bdl | 0.23 |
| Arrieros/LB Ore S-oxidizer only | 1 | bdl | bdl | bdl | bdl | 8.03 |
| Arrieros/LB Ore S-oxidizer only | 2 | bdl | bdl | 0.012 | bdl | 4.67 |
| Arrieros/LB Ore S-oxidizer only | 3 | bdl | bdl | 0.015 | bdl | 3.61 |
| Arrieros/LB Ore S-oxidizer only | 4 | bdl | bdl | 0.002 | bdl | 2.94 |
| Arrieros/LB Ore S-oxidizer only | 5 | bdl | bdl | 0.006 | bdl | 2.01 |
| Arrieros/LB Ore S-oxidizer only | 6 | bdl | bdl | 0.008 | bdl | 1.58 |
| Arrieros/LB Ore S-oxidizer only | 7 | bdl | bdl | 0.008 | bdl | 1.24 |
| Arrieros/LB Ore S-oxidizer only | 8 | bdl | bdl | 0.003 | bdl | 0.99 |
| Arrieros/LB Ore S-oxidizer only | 9 | bdl | bdl | 0.004 | bdl | 0.80 |
| Arrieros/LB Ore S-oxidizer only | 10 | bdl | bdl | 0.004 | bdl | 0.71 |
| Arrieros/LB Ore S-oxidizer only | 11 | bdl | bdl | 0.017 | bdl | 0.62 |
| Arrieros/LB Ore S-oxidizer only | 12 | bdl | bdl | 0.008 | bdl | 0.45 |
| Arrieros/LB Ore S-oxidizer only | 13 | bdl | bdl | bdl | bdl | 0.58 |
| Arrieros/LB Ore S-oxidizer only | 14 | bdl | bdl | 0.008 | bdl | 0.40 |
| Arrieros/LB Ore S-oxidizer only | 15 | bdl | bdl | 0.005 | bdl | 0.36 |
| Arrieros/LB Ore S-oxidizer only | 16 | bdl | bdl | 0.017 | bdl | 0.32 |
| Arrieros/LB Ore S-oxidizer only | 17 | bdl | bdl | 0.004 | bdl | 0.34 |
| Arrieros/LB Ore S-oxidizer only | 18 | bdl | bdl | bdl | bdl | 0.29 |
| Arrieros/LB Ore S-oxidizer only | 19 | bdl | bdl | 0.016 | bdl | 0.23 |
| Arrieros/LB Ore S-oxidizer only | 20 | bdl | bdl | 0.014 | bdl | 0.25 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.04 | 4 | 0.003 | bdl | bdl | 5.1 | bdl | Sat | 0.08 |
| 0.04 | 4 | bdl | bdl | bdl | 4.4 | bdl | Sat | 0.07 |
| 0.06 | 6 | 0.002 | bdl | bdl | 6.1 | bdl | Sat | 0.08 |
| 0.07 | 6 | 0.004 | bdl | bdl | 6.5 | bdl | Sat | 0.08 |
| 0.06 | 6 | 0.004 | bdl | bdl | 6.2 | bdl | Sat | 0.08 |
| 0.05 | 5 | 0.003 | bdl | bdl | 5.1 | bdl | 34 | 0.06 |
| 0.05 | 5 | 0.003 | bdl | bdl | 3.6 | bdl | 28 | 0.04 |
| 0.05 | 5 | 0.002 | bdl | bdl | 3.6 | bdl | 28 | 0.04 |
| 0.06 | 7 | bdl | bdl | bdl | 4.5 | bdl | Sat | 0.05 |
| 0.07 | 10 | bdl | bdl | bdl | 4.7 | bdl | Sat | 0.05 |
| 0.07 | 11 | bdl | bdl | bdl | 4.5 | bdl | Sat | 0.05 |
| 0.05 | 66 | 0.015 | bdl | bdl | 38.9 | bdl | Sat | 0.75 |
| 0.03 | 20 | 0.007 | bdl | bdl | 16.9 | bdl | Sat | 0.36 |
| 0.03 | 15 | 0.006 | bdl | bdl | 12.9 | bdl | Sat | 0.29 |
| 0.04 | 11 | 0.005 | bdl | bdl | 10.1 | bdl | Sat | 0.25 |
| 0.04 | 8 | 0.004 | bdl | bdl | 8.2 | bdl | Sat | 0.20 |
| 0.04 | 6 | 0.003 | bdl | bdl | 5.7 | bdl | Sat | 0.15 |
| 0.04 | 5 | 0.003 | bdl | bdl | 4.3 | bdl | Sat | 0.12 |
| 0.04 | 4 | 0.003 | bdl | bdl | 3.6 | bdl | 43 | 0.11 |
| 0.05 | 4 | 0.002 | bdl | bdl | 3.4 | bdl | 41 | 0.10 |
| 0.05 | 3 | 0.002 | bdl | bdl | 3.0 | bdl | 37 | 0.09 |
| 0.06 | 3 | 0.001 | bdl | bdl | 2.7 | bdl | 34 | 0.08 |
| 0.06 | 3 | 0.002 | bdl | bdl | 2.3 | bdl | 29 | 0.07 |
| 0.10 | 6 | 0.001 | bdl | bdl | 3.4 | bdl | 37 | 0.09 |
| 0.11 | 7 | 0.004 | bdl | bdl | 4.7 | bdl | Sat | 0.09 |
| 0.10 | 11 | 0.006 | bdl | bdl | 6.4 | bdl | Sat | 0.09 |
| 0.06 | 12 | 0.006 | bdl | bdl | 7.0 | bdl | Sat | 0.08 |
| 0.05 | 14 | 0.007 | bdl | bdl | 8.7 | bdl | Sat | 0.08 |
| 0.04 | 13 | 0.006 | bdl | bdl | 7.0 | bdl | 36 | 0.07 |
| 0.04 | 12 | 0.006 | bdl | bdl | 6.0 | bdl | 33 | 0.06 |
| 0.04 | 11 | bdl | bdl | bdl | 5.8 | bdl | Sat | 0.07 |
| 0.05 | 14 | bdl | bdl | bdl | 6.1 | bdl | Sat | 0.08 |
| 0.05 | 14 | bdl | bdl | bdl | 5.5 | bdl | Sat | 0.08 |
| 0.09 | 362 | 0.115 | bdl | bdl | 177.4 | bdl | Sat | 1.66 |
| 0.05 | 99 | 0.021 | bdl | bdl | 52.6 | bdl | Sat | 0.67 |
| 0.04 | 39 | 0.009 | bdl | bdl | 30.1 | bdl | Sat | 0.47 |
| 0.04 | 25 | 0.007 | bdl | bdl | 23.7 | bdl | Sat | 0.40 |
| 0.03 | 16 | 0.005 | bdl | bdl | 15.7 | bdl | Sat | 0.28 |
| 0.03 | 12 | 0.004 | bdl | bdl | 13.4 | bdl | Sat | 0.24 |
| 0.03 | 9 | 0.003 | bdl | bdl | 10.0 | bdl | Sat | 0.20 |
| 0.03 | 7 | 0.002 | bdl | bdl | 7.4 | bdl | Sat | 0.16 |
| 0.04 | 5 | 0.002 | bdl | bdl | 5.7 | bdl | Sat | 0.14 |
| 0.04 | 5 | 0.002 | bdl | bdl | 4.9 | bdl | Sat | 0.13 |
| 0.04 | 4 | 0.002 | bdl | bdl | 4.5 | bdl | Sat | 0.12 |
| 0.04 | 4 | 0.003 | bdl | bdl | 3.8 | bdl | 40 | 0.10 |
| 0.05 | 5 | 0.000 | bdl | bdl | 4.3 | bdl | Sat | 0.11 |
| 0.07 | 5 | 0.003 | bdl | bdl | 5.2 | bdl | Sat | 0.11 |
| 0.07 | 6 | 0.003 | bdl | bdl | 5.0 | bdl | Sat | 0.10 |
| 0.05 | 5 | 0.003 | bdl | bdl | 3.8 | bdl | 37 | 0.08 |
| 0.05 | 5 | 0.003 | bdl | bdl | 4.1 | bdl | 33 | 0.07 |
| 0.05 | 5 | 0.003 | bdl | bdl | 3.7 | bdl | 31 | 0.06 |
| 0.04 | 4 | 0.003 | bdl | bdl | 3.2 | bdl | 30 | 0.06 |
| 0.06 | 6 | bdl | bdl | bdl | 3.7 | bdl | Sat | 0.07 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 1.7 | 0.56 | 0.04 | 17 | 0.007 | bdl | bdl | 21 | bdl |
| 1.5 | 0.54 | 0.04 | 19 | 0.002 | bdl | bdl | 19 | bdl |
| 2.3 | 0.83 | 0.04 | 25 | 0.008 | bdl | bdl | 18 | bdl |
| 2.8 | 1.00 | 0.03 | 31 | 0.012 | bdl | 0.021 | 16 | bdl |
| 3.0 | 1.04 | 0.04 | 34 | 0.011 | bdl | 0.002 | 18 | bdl |
| 2.9 | 0.91 | 0.05 | 26 | 0.011 | bdl | 0.000 | 21 | bdl |
| 2.8 | 0.79 | 0.05 | 21 | 0.007 | bdl | 0.003 | 18 | bdl |
| 2.9 | 0.81 | 0.05 | 21 | 0.007 | bdl | 0.005 | 17 | bdl |
| 3.9 | 1.06 | 0.04 | 25 | 0.009 | bdl | 0.003 | 17 | bdl |
| 6.0 | 1.44 | 0.05 | 36 | 0.014 | bdl | 0.005 | 20 | bdl |
| 6.4 | 1.50 | 0.06 | 39 | 0.012 | bdl | 0.015 | 20 | bdl |
| 7.0 | 2.32 | 0.03 | 31 | 0.030 | bdl | 0.066 | 161 | bdl |
| 3.5 | 1.12 | 0.03 | 20 | 0.015 | bdl | 0.029 | 73 | bdl |
| 3.1 | 0.98 | 0.03 | 19 | 0.013 | bdl | 0.039 | 57 | bdl |
| 2.7 | 0.85 | 0.03 | 21 | 0.012 | bdl | 0.018 | 45 | bdl |
| 2.3 | 0.75 | 0.03 | 22 | 0.008 | bdl | 0.013 | 34 | bdl |
| 1.8 | 0.61 | 0.04 | 22 | 0.006 | bdl | 0.010 | 30 | bdl |
| 1.5 | 0.52 | 0.04 | 18 | 0.006 | bdl | 0.003 | 25 | bdl |
| 1.3 | 0.46 | 0.04 | 15 | 0.005 | bdl | bdl | 20 | bdl |
| 1.4 | 0.47 | 0.04 | 16 | 0.006 | bdl | 0.003 | 18 | bdl |
| 1.3 | 0.45 | 0.04 | 16 | 0.005 | bdl | bdl | 16 | bdl |
| 1.3 | 0.44 | 0.04 | 18 | 0.003 | bdl | bdl | 15 | bdl |
| 1.2 | 0.42 | 0.04 | 17 | 0.003 | bdl | 0.005 | 13 | bdl |
| 2.2 | 0.84 | 0.05 | 28 | 0.006 | bdl | bdl | 13 | bdl |
| 3.3 | 1.14 | 0.04 | 38 | 0.012 | bdl | bdl | 14 | bdl |
| 5.5 | 1.81 | 0.04 | 45 | 0.019 | bdl | 0.008 | 27 | bdl |
| 6.0 | 1.98 | 0.04 | 37 | 0.022 | bdl | 0.002 | 38 | bdl |
| 7.3 | 2.35 | 0.03 | 25 | 0.025 | bdl | 0.004 | 42 | bdl |
| 6.8 | 2.15 | 0.03 | 20 | 0.024 | bdl | 0.001 | 36 | bdl |
| 6.3 | 1.94 | 0.03 | 18 | 0.021 | bdl | 0.002 | 31 | bdl |
| 6.4 | 1.93 | 0.03 | 18 | 0.019 | bdl | 0.008 | 26 | bdl |
| 8.0 | 2.29 | 0.03 | 33 | 0.025 | bdl | 0.007 | 21 | bdl |
| 8.2 | 2.26 | 0.03 | 42 | 0.025 | bdl | 0.003 | 22 | bdl |
| 47.8 | 17.59 | 0.04 | 92 | 0.192 | bdl | 0.273 | 635 | bdl |
| 9.2 | 3.02 | 0.02 | 29 | 0.040 | bdl | 0.087 | 202 | bdl |
| 4.6 | 1.47 | 0.02 | 22 | 0.021 | bdl | 0.048 | 109 | bdl |
| 3.7 | 1.17 | 0.02 | 21 | 0.016 | bdl | 0.031 | 83 | bdl |
| 2.8 | 0.90 | 0.02 | 18 | 0.012 | bdl | 0.023 | 57 | bdl |
| 2.4 | 0.79 | 0.02 | 20 | 0.010 | bdl | 0.018 | 47 | bdl |
| 1.9 | 0.65 | 0.03 | 20 | 0.008 | bdl | 0.008 | 40 | bdl |
| 1.6 | 0.55 | 0.03 | 18 | 0.006 | bdl | 0.007 | 34 | bdl |
| 1.4 | 0.49 | 0.03 | 17 | 0.005 | bdl | 0.002 | 27 | bdl |
| 1.4 | 0.48 | 0.03 | 17 | 0.004 | bdl | 0.003 | 24 | bdl |
| 1.3 | 0.47 | 0.03 | 17 | 0.004 | bdl | bdl | 22 | bdl |
| 1.2 | 0.42 | 0.03 | 16 | 0.005 | bdl | 0.004 | 19 | bdl |
| 1.5 | 0.59 | 0.05 | 21 | 0.005 | bdl | bdl | 22 | bdl |
| 1.9 | 0.72 | 0.03 | 28 | 0.007 | bdl | 0.004 | 14 | bdl |
| 2.4 | 0.85 | 0.03 | 34 | 0.009 | bdl | 0.000 | 15 | bdl |
| 2.0 | 0.72 | 0.03 | 28 | 0.007 | bdl | 0.000 | 17 | bdl |
| 2.2 | 0.74 | 0.04 | 22 | 0.008 | bdl | 0.005 | 20 | bdl |
| 2.1 | 0.72 | 0.04 | 20 | 0.007 | bdl | bdl | 19 | bdl |
| 2.0 | 0.62 | 0.03 | 16 | 0.005 | bdl | 0.002 | 15 | bdl |
| 2.9 | 0.92 | 0.03 | 19 | 0.008 | bdl | 0.004 | 16 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| bdl | 32.3 | 0.11 | bdl | bdl | 0.04 | 0.26 |
| 0.008 | 30.4 | 0.10 | bdl | bdl | 0.01 | 0.26 |
| 0.009 | 34.9 | 0.14 | bdl | bdl | 0.01 | 0.40 |
| bdl | 32.5 | 0.17 | bdl | bdl | 0.01 | 0.41 |
| 0.009 | 33.4 | 0.17 | bdl | bdl | 0.01 | 0.40 |
| bdl | 30.3 | 0.14 | bdl | bdl | 0.01 | 0.32 |
| bdl | 27.2 | 0.12 | bdl | bdl | 0.01 | 0.26 |
| bdl | 26.6 | 0.12 | bdl | bdl | 0.01 | 0.26 |
| 0.003 | 27.3 | 0.16 | bdl | bdl | 0.01 | 0.33 |
| bdl | 26.8 | 0.22 | bdl | bdl | 0.01 | 0.40 |
| 0.007 | 26.5 | 0.23 | bdl | bdl | 0.03 | 0.44 |
| 0.033 | 37.9 | 0.68 | bdl | bdl | 0.05 | 1.49 |
| 0.010 | 33.1 | 0.30 | bdl | bdl | 0.01 | 0.68 |
| 0.014 | 34.4 | 0.25 | bdl | bdl | 0.04 | 0.62 |
| bdl | 34.7 | 0.20 | bdl | bdl | 0.04 | 0.48 |
| 0.006 | 33.7 | 0.17 | bdl | bdl | 0.03 | 0.40 |
| bdl | 32.6 | 0.13 | bdl | bdl | 0.04 | 0.30 |
| bdl | 32.4 | 0.11 | bdl | bdl | 0.04 | 0.25 |
| bdl | 30.2 | 0.10 | bdl | bdl | 0.02 | 0.21 |
| bdl | 30.9 | 0.10 | bdl | bdl | 0.03 | 0.21 |
| 0.004 | 29.9 | 0.09 | bdl | bdl | 0.03 | 0.19 |
| 0.007 | 29.8 | 0.09 | bdl | bdl | 0.03 | 0.18 |
| 0.003 | 27.1 | 0.08 | bdl | bdl | 0.04 | 0.16 |
| 0.010 | 32.9 | 0.14 | bdl | bdl | 0.03 | 0.34 |
| bdl | 28.9 | 0.21 | bdl | bdl | 0.01 | 0.38 |
| 0.001 | 32.0 | 0.30 | bdl | bdl | 0.01 | 0.57 |
| 0.001 | 31.4 | 0.29 | bdl | bdl | 0.01 | 0.60 |
| bdl | 34.3 | 0.31 | bdl | bdl | 0.01 | 0.70 |
| bdl | 32.9 | 0.27 | bdl | bdl | 0.02 | 0.61 |
| bdl | 33.0 | 0.24 | bdl | bdl | 0.01 | 0.58 |
| 0.002 | 32.9 | 0.24 | bdl | bdl | 0.01 | 0.59 |
| bdl | 32.5 | 0.31 | bdl | bdl | 0.02 | 0.70 |
| 0.007 | 31.4 | 0.32 | bdl | bdl | 0.03 | 0.68 |
| 0.036 | 42.2 | 2.37 | bdl | bdl | 0.04 | 10.04 |
| 0.015 | 34.6 | 0.80 | bdl | bdl | 0.02 | 2.02 |
| 0.007 | 35.2 | 0.45 | bdl | bdl | 0.04 | 0.99 |
| 0.013 | 36.7 | 0.35 | bdl | bdl | 0.04 | 0.74 |
| 0.009 | 35.0 | 0.24 | bdl | bdl | 0.03 | 0.54 |
| bdl | 34.5 | 0.20 | bdl | bdl | 0.04 | 0.45 |
| 0.013 | 34.7 | 0.16 | bdl | bdl | 0.03 | 0.36 |
| bdl | 34.0 | 0.13 | bdl | bdl | 0.03 | 0.28 |
| bdl | 33.6 | 0.11 | bdl | bdl | 0.03 | 0.24 |
| 0.006 | 34.2 | 0.11 | bdl | bdl | 0.04 | 0.22 |
| bdl | 33.4 | 0.10 | bdl | bdl | 0.03 | 0.21 |
| bdl | 30.8 | 0.09 | bdl | bdl | bdl | 0.19 |
| bdl | 38.0 | 0.10 | bdl | bdl | 0.02 | 0.28 |
| bdl | 31.4 | 0.14 | bdl | bdl | 0.01 | 0.30 |
| bdl | 31.6 | 0.15 | bdl | bdl | 0.01 | 0.32 |
| bdl | 30.2 | 0.12 | bdl | bdl | 0.01 | 0.26 |
| bdl | 32.1 | 0.12 | bdl | bdl | 0.01 | 0.28 |
| bdl | 30.9 | 0.11 | bdl | bdl | 0.01 | 0.25 |
| bdl | 27.7 | 0.11 | bdl | bdl | 0.03 | 0.23 |
| bdl | 31.2 | 0.14 | bdl | bdl | 0.01 | 0.32 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Arrieros/LB Ore S-oxidizer only | 21 | bdl | bdl | 0.011 | bdl | 0.23 |
| Arrieros/LB Ore S-oxidizer only | 22 | bdl | bdl | 0.007 | bdl | 0.21 |
| Arrieros/LB Ore methanotroph only | 1 | bdl | bdl | bdl | bdl | 7.22 |
| Arrieros/LB Ore methanotroph only | 2 | bdl | bdl | bdl | bdl | 4.68 |
| Arrieros/LB Ore methanotroph only | 3 | bdl | bdl | 0.003 | bdl | 3.76 |
| Arrieros/LB Ore methanotroph only | 4 | bdl | bdl | 0.005 | bdl | 3.08 |
| Arrieros/LB Ore methanotroph only | 5 | bdl | bdl | 0.013 | bdl | 2.28 |
| Arrieros/LB Ore methanotroph only | 6 | bdl | bdl | 0.008 | bdl | 1.63 |
| Arrieros/LB Ore methanotroph only | 7 | bdl | bdl | 0.004 | bdl | 1.41 |
| Arrieros/LB Ore methanotroph only | 8 | bdl | bdl | 0.003 | bdl | 1.16 |
| Arrieros/LB Ore methanotroph only | 9 | bdl | bdl | 0.008 | bdl | 1.01 |
| Arrieros/LB Ore methanotroph only | 10 | bdl | bdl | 0.001 | bdl | 0.91 |
| Arrieros/LB Ore methanotroph only | 11 | bdl | bdl | bdl | bdl | 0.82 |
| Arrieros/LB Ore methanotroph only | 12 | bdl | bdl | 0.011 | bdl | 0.62 |
| Arrieros/LB Ore methanotroph only | 13 | bdl | bdl | bdl | bdl | 0.81 |
| Arrieros/LB Ore methanotroph only | 14 | bdl | bdl | bdl | bdl | 0.56 |
| Arrieros/LB Ore methanotroph only | 15 | bdl | bdl | 0.003 | bdl | 0.52 |
| Arrieros/LB Ore methanotroph only | 16 | bdl | bdl | 0.009 | bdl | 0.47 |
| Arrieros/LB Ore methanotroph only | 17 | bdl | bdl | 0.005 | bdl | 0.45 |
| Arrieros/LB Ore methanotroph only | 18 | bdl | bdl | bdl | bdl | 0.39 |
| Arrieros/LB Ore methanotroph only | 19 | bdl | bdl | 0.003 | bdl | 0.36 |
| Arrieros/LB Ore methanotroph only | 20 | bdl | bdl | 0.006 | bdl | 0.35 |
| Arrieros/LB Ore methanotroph only | 21 | bdl | bdl | 0.012 | bdl | 0.33 |
| Arrieros/LB Ore methanotroph only | 22 | bdl | bdl | 0.002 | bdl | 0.33 |
| Arrieros/LB Ore control | 1 | bdl | 0.05 | bdl | bdl | 0.94 |
| Arrieros/LB Ore control | 2 | bdl | 0.02 | bdl | bdl | 0.96 |
| Arrieros/LB Ore control | 3 | bdl | 0.03 | bdl | bdl | 0.88 |
| Arrieros/LB Ore control | 4 | bdl | 0.02 | bdl | bdl | 0.82 |
| Arrieros/LB Ore control | 5 | bdl | 0.02 | bdl | bdl | 0.71 |
| Arrieros/LB Ore control | 6 | bdl | 0.02 | bdl | bdl | 0.62 |
| Arrieros/LB Ore control | 7 | bdl | 0.03 | bdl | bdl | 0.56 |
| Arrieros/LB Ore control | 8 | bdl | 0.04 | bdl | bdl | 0.52 |
| Arrieros/LB Ore control | 9 | bdl | 0.03 | bdl | bdl | 0.46 |
| Arrieros/LB Ore control | 10 | bdl | 0.02 | bdl | bdl | 0.42 |
| Arrieros/LB Ore control | 11 | bdl | 0.02 | bdl | bdl | 0.39 |
| Arrieros/LB Ore control | 12 | bdl | 0.02 | bdl | bdl | 0.38 |
| Arrieros/LB Ore control | 13 | bdl | 0.02 | bdl | bdl | 0.37 |
| Arrieros/LB Ore control | 14 | bdl | 0.01 | bdl | bdl | 0.33 |
| Arrieros/LB Ore control | 15 | bdl | 0.02 | bdl | bdl | 0.31 |
| Arrieros/LB Ore control | 16 | bdl | 0.03 | bdl | bdl | 0.31 |
| Arrieros/LB Ore control | 17 | bdl | 0.04 | bdl | bdl | 0.28 |
| Arrieros/LB Ore control | 18 | bdl | 0.02 | bdl | bdl | 0.25 |
| Arrieros/LB Ore control | 19 | bdl | 0.02 | bdl | bdl | 0.24 |
| Arrieros/LB Ore control | 20 | bdl | 0.03 | bdl | bdl | 0.21 |
| Arrieros/LB Ore control | 21 | bdl | 0.02 | bdl | bdl | 0.20 |
| Arrieros/LB Ore control | 22 | bdl | 0.02 | bdl | bdl | 0.17 |
| Arrieros/LB Ore control | 23 | bdl | 0.03 | bdl | bdl | 0.18 |
| Arrieros/LB Ore control | 24 | bdl | 0.03 | bdl | bdl | 0.19 |
| Arrieros/LB Ore control | 25 | bdl | 0.03 | bdl | bdl | 0.16 |
| Arrieros/LB Ore control | 26 | bdl | 0.02 | bdl | bdl | 0.16 |
| Arrieros/LB Ore control | 27 | bdl | 0.03 | bdl | bdl | 0.15 |
| Arrieros/LB Ore control | 28 | bdl | 0.03 | bdl | bdl | 0.15 |
| Arrieros/LB Ore mixed culture | 1 | bdl | 0.16 | bdl | bdl | 1.15 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.10 | 10 | bdl | bdl | bdl | 5.2 | bdl | Sat | 0.10 |
| 0.09 | 10 | bdl | bdl | bdl | 4.7 | bdl | Sat | 0.09 |
| 0.08 | 374 | 0.057 | bdl | bdl | 122.0 | bdl | Sat | 1.27 |
| 0.04 | 62 | 0.012 | bdl | bdl | 38.8 | bdl | Sat | 0.60 |
| 0.04 | 32 | 0.008 | bdl | bdl | 28.6 | bdl | Sat | 0.48 |
| 0.03 | 22 | 0.007 | bdl | bdl | 23.9 | bdl | Sat | 0.42 |
| 0.03 | 16 | 0.005 | bdl | bdl | 18.7 | bdl | Sat | 0.31 |
| 0.03 | 11 | 0.004 | bdl | bdl | 13.9 | bdl | Sat | 0.24 |
| 0.03 | 9 | 0.003 | bdl | bdl | 12.0 | bdl | Sat | 0.22 |
| 0.03 | 7 | 0.003 | bdl | bdl | 9.6 | bdl | Sat | 0.19 |
| 0.04 | 6 | 0.003 | bdl | bdl | 8.5 | bdl | Sat | 0.17 |
| 0.04 | 5 | 0.003 | bdl | bdl | 7.3 | bdl | Sat | 0.15 |
| 0.04 | 5 | 0.003 | bdl | bdl | 6.2 | bdl | Sat | 0.14 |
| 0.04 | 4 | 0.003 | bdl | bdl | 4.6 | bdl | Sat | 0.11 |
| 0.05 | 6 | 0.001 | bdl | bdl | 4.7 | bdl | Sat | 0.13 |
| 0.06 | 5 | 0.004 | bdl | bdl | 4.4 | bdl | Sat | 0.11 |
| 0.07 | 6 | 0.004 | bdl | bdl | 5.2 | bdl | Sat | 0.12 |
| 0.06 | 5 | 0.004 | bdl | bdl | 4.4 | bdl | Sat | 0.11 |
| 0.04 | 4 | 0.003 | bdl | bdl | 4.1 | bdl | Sat | 0.09 |
| 0.04 | 4 | 0.003 | bdl | bdl | 3.5 | bdl | 37 | 0.08 |
| 0.04 | 4 | 0.003 | bdl | bdl | 3.3 | bdl | 36 | 0.07 |
| 0.05 | 4 | bdl | bdl | bdl | 3.2 | bdl | Sat | 0.09 |
| 0.06 | 6 | bdl | bdl | bdl | 3.8 | bdl | Sat | 0.10 |
| 0.07 | 7 | bdl | bdl | bdl | 4.4 | bdl | Sat | 0.11 |
| 0.04 | 6 | bdl | bdl | bdl | 7.5 | 0.07 | Sat | 0.13 |
| 0.03 | 5 | bdl | bdl | bdl | 8.5 | 0.02 | Sat | 0.12 |
| 0.03 | 5 | bdl | bdl | bdl | 8.2 | 0.02 | 49 | 0.11 |
| 0.04 | 5 | bdl | bdl | bdl | 7.8 | 0.02 | 47 | 0.10 |
| 0.04 | 4 | bdl | bdl | bdl | 7.1 | 0.02 | Sat | 0.09 |
| 0.04 | 4 | bdl | bdl | bdl | 6.7 | 0.03 | 40 | 0.08 |
| 0.04 | 4 | bdl | bdl | bdl | 7.0 | 0.03 | 41 | 0.08 |
| 0.06 | 8 | bdl | bdl | bdl | 9.9 | 0.05 | Sat | 0.10 |
| 0.04 | 6 | bdl | bdl | bdl | 8.1 | 0.03 | 46 | 0.08 |
| 0.03 | 6 | bdl | bdl | bdl | 6.5 | 0.02 | 39 | 0.07 |
| 0.04 | 6 | bdl | bdl | bdl | 6.9 | 0.01 | 39 | 0.07 |
| 0.05 | 8 | bdl | bdl | bdl | 8.2 | 0.02 | 44 | 0.07 |
| 0.04 | 7 | bdl | bdl | bdl | 7.1 | 0.02 | 39 | 0.06 |
| 0.03 | 5 | bdl | bdl | bdl | 5.3 | 0.01 | 30 | 0.05 |
| 0.04 | 5 | bdl | bdl | bdl | 5.0 | 0.01 | 27 | 0.04 |
| 0.04 | 5 | bdl | bdl | bdl | 5.4 | 0.02 | 27 | 0.05 |
| 0.07 | 10 | bdl | bdl | bdl | 9.0 | 0.04 | 42 | 0.06 |
| 0.04 | 7 | bdl | bdl | bdl | 5.0 | 0.02 | 29 | 0.04 |
| 0.04 | 5 | bdl | bdl | bdl | 4.2 | 0.10 | 23 | 0.03 |
| 0.07 | 9 | bdl | bdl | bdl | 6.2 | 0.03 | 33 | 0.04 |
| 0.03 | 6 | bdl | bdl | bdl | 3.2 | 0.02 | 23 | 0.02 |
| 0.05 | 5 | bdl | bdl | bdl | 3.7 | 0.03 | 20 | 0.02 |
| 0.05 | 5 | bdl | bdl | bdl | 4.1 | 0.02 | 21 | 0.02 |
| 0.06 | 6 | bdl | bdl | bdl | 4.4 | 0.03 | 23 | 0.02 |
| 0.06 | 5 | bdl | bdl | bdl | 3.9 | 0.03 | 21 | 0.02 |
| 0.05 | 5 | bdl | bdl | bdl | 3.6 | 0.02 | 20 | 0.02 |
| 0.05 | 4 | bdl | bdl | bdl | 3.2 | 0.03 | 19 | 0.02 |
| 0.05 | 4 | bdl | bdl | bdl | 3.2 | 0.04 | 19 | 0.02 |
| 0.04 | 6 | bdl | bdl | bdl | 9.2 | 2.27 | Sat | 0.14 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 5.3 | 1.66 | 0.03 | 37 | 0.016 | bdl | 0.004 | 13 | bdl |
| 5.6 | 1.78 | 0.03 | 45 | 0.017 | bdl | 0.000 | 16 | bdl |
| 22.3 | 7.74 | 0.03 | 53 | 0.095 | bdl | 0.181 | 529 | bdl |
| 5.5 | 1.71 | 0.02 | 25 | 0.025 | bdl | 0.065 | 148 | bdl |
| 4.4 | 1.37 | 0.02 | 22 | 0.021 | bdl | 0.040 | 104 | bdl |
| 3.9 | 1.22 | 0.02 | 22 | 0.018 | bdl | 0.032 | 81 | bdl |
| 3.2 | 1.03 | 0.02 | 18 | 0.014 | bdl | 0.029 | 62 | bdl |
| 2.7 | 0.86 | 0.02 | 19 | 0.012 | bdl | 0.017 | 46 | bdl |
| 2.5 | 0.81 | 0.03 | 21 | 0.011 | bdl | 0.012 | 44 | bdl |
| 2.1 | 0.70 | 0.03 | 20 | 0.010 | bdl | 0.010 | 39 | bdl |
| 1.9 | 0.62 | 0.03 | 19 | 0.008 | bdl | 0.010 | 34 | bdl |
| 1.8 | 0.59 | 0.03 | 18 | 0.006 | bdl | 0.014 | 30 | bdl |
| 1.7 | 0.58 | 0.03 | 18 | 0.007 | bdl | 0.006 | 27 | bdl |
| 1.5 | 0.52 | 0.03 | 16 | 0.008 | bdl | 0.010 | 23 | bdl |
| 1.8 | 0.70 | 0.04 | 21 | 0.004 | bdl | bdl | 27 | bdl |
| 1.8 | 0.65 | 0.03 | 21 | 0.008 | bdl | 0.008 | 17 | bdl |
| 2.4 | 0.89 | 0.02 | 32 | 0.009 | bdl | 0.001 | 15 | bdl |
| 2.3 | 0.84 | 0.03 | 33 | 0.009 | bdl | bdl | 17 | bdl |
| 1.9 | 0.72 | 0.04 | 27 | 0.009 | bdl | 0.004 | 24 | bdl |
| 1.8 | 0.68 | 0.04 | 22 | 0.007 | bdl | 0.017 | 21 | bdl |
| 1.8 | 0.69 | 0.04 | 20 | 0.008 | bdl | 0.000 | 19 | bdl |
| 2.1 | 0.79 | 0.04 | 19 | 0.008 | bdl | 0.005 | 18 | bdl |
| 2.8 | 1.05 | 0.03 | 23 | 0.009 | bdl | 0.008 | 16 | bdl |
| 3.8 | 1.45 | 0.03 | 31 | 0.013 | bdl | 0.001 | 15 | bdl |
| 1.5 | 0.50 | 0.03 | 15 | 0.009 | bdl | 0.011 | 28 | bdl |
| 1.7 | 0.53 | 0.03 | 16 | 0.018 | bdl | 0.014 | 29 | bdl |
| 1.6 | 0.51 | 0.03 | 16 | 0.015 | bdl | 0.013 | 26 | bdl |
| 1.6 | 0.51 | 0.03 | 17 | 0.013 | bdl | 0.014 | 26 | bdl |
| 1.5 | 0.48 | 0.03 | 17 | 0.013 | bdl | 0.010 | 24 | bdl |
| 1.5 | 0.47 | 0.03 | 17 | 0.017 | bdl | 0.008 | 22 | bdl |
| 1.6 | 0.51 | 0.03 | 18 | 0.012 | bdl | 0.009 | 20 | bdl |
| 3.0 | 0.94 | 0.03 | 39 | 0.019 | bdl | 0.017 | 19 | bdl |
| 2.8 | 0.89 | 0.03 | 38 | 0.017 | bdl | 0.013 | 25 | bdl |
| 2.4 | 0.78 | 0.04 | 30 | 0.017 | bdl | 0.009 | 28 | bdl |
| 2.8 | 0.88 | 0.03 | 26 | 0.013 | bdl | 0.013 | 22 | bdl |
| 3.9 | 1.24 | 0.03 | 35 | 0.019 | bdl | 0.010 | 19 | bdl |
| 3.8 | 1.18 | 0.03 | 38 | 0.016 | bdl | 0.008 | 22 | bdl |
| 2.8 | 0.85 | 0.04 | 29 | 0.012 | bdl | 0.011 | 22 | bdl |
| 2.5 | 0.78 | 0.04 | 23 | 0.011 | bdl | 0.007 | 21 | bdl |
| 2.7 | 0.80 | 0.03 | 69 | 0.011 | bdl | 0.010 | 21 | bdl |
| 6.1 | 1.71 | 0.02 | 138 | 0.022 | bdl | 0.016 | 17 | bdl |
| 4.2 | 1.11 | 0.04 | 111 | 0.015 | bdl | 0.008 | 26 | bdl |
| 3.0 | 0.78 | 0.04 | 65 | 0.011 | bdl | 0.032 | 20 | bdl |
| 5.8 | 1.31 | 0.02 | 129 | 0.016 | bdl | 0.010 | 16 | bdl |
| 4.0 | 0.78 | 0.05 | 94 | 0.012 | bdl | 0.006 | 26 | bdl |
| 3.4 | 0.61 | 0.03 | 57 | 0.006 | bdl | 0.009 | 17 | bdl |
| 3.7 | 0.64 | 0.03 | 58 | 0.009 | bdl | 0.012 | 16 | bdl |
| 4.2 | 0.70 | 0.03 | 69 | 0.008 | bdl | 0.006 | 16 | bdl |
| 3.9 | 0.63 | 0.03 | 22 | 0.007 | bdl | 0.007 | 13 | bdl |
| 3.7 | 0.59 | 0.03 | 22 | 0.007 | bdl | 0.004 | 14 | bdl |
| 3.4 | 0.53 | 0.03 | 22 | 0.006 | bdl | 0.008 | 15 | bdl |
| 3.3 | 0.51 | 0.03 | 21 | 0.006 | bdl | 0.008 | 16 | bdl |
| 2.4 | 0.58 | 0.04 | 16 | 0.077 | bdl | 0.011 | 32 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.001 | 31.7 | 0.26 | bdl | bdl | 0.03 | 0.52 |
| bdl | 31.3 | 0.26 | bdl | bdl | 0.03 | 0.49 |
| 0.032 | 36.1 | 2.02 | bdl | bdl | 0.02 | 5.28 |
| 0.019 | 33.8 | 0.62 | bdl | bdl | 0.02 | 1.21 |
| bdl | 35.6 | 0.43 | bdl | bdl | 0.03 | 0.88 |
| 0.006 | 37.2 | 0.35 | bdl | bdl | 0.04 | 0.72 |
| 0.014 | 34.5 | 0.26 | bdl | bdl | 0.03 | 0.59 |
| bdl | 33.4 | 0.21 | bdl | bdl | 0.03 | 0.47 |
| bdl | 36.0 | 0.19 | bdl | bdl | 0.04 | 0.42 |
| 0.004 | 34.7 | 0.15 | bdl | bdl | 0.03 | 0.36 |
| bdl | 35.0 | 0.14 | bdl | bdl | 0.04 | 0.32 |
| bdl | 35.2 | 0.12 | bdl | bdl | 0.04 | 0.29 |
| 0.006 | 35.1 | 0.12 | bdl | bdl | 0.04 | 0.27 |
| bdl | 32.1 | 0.10 | bdl | bdl | bdl | 0.23 |
| bdl | 39.9 | 0.11 | bdl | bdl | 0.02 | 0.32 |
| bdl | 32.9 | 0.12 | bdl | bdl | 0.01 | 0.30 |
| 0.001 | 34.7 | 0.16 | bdl | bdl | 0.01 | 0.36 |
| bdl | 34.4 | 0.14 | bdl | bdl | 0.01 | 0.34 |
| bdl | 35.2 | 0.11 | bdl | bdl | 0.01 | 0.28 |
| bdl | 33.8 | 0.10 | bdl | bdl | 0.01 | 0.27 |
| bdl | 33.3 | 0.10 | bdl | bdl | 0.01 | 0.26 |
| 0.008 | 33.6 | 0.11 | bdl | bdl | 0.01 | 0.32 |
| bdl | 34.0 | 0.15 | bdl | bdl | 0.02 | 0.38 |
| bdl | 33.5 | 0.19 | bdl | bdl | 0.03 | 0.45 |
| bdl | 23.3 | 0.11 | bdl | bdl | bdl | 0.32 |
| bdl | 25.9 | 0.11 | bdl | bdl | bdl | 0.34 |
| 0.003 | 25.4 | 0.11 | bdl | bdl | bdl | 0.51 |
| 0.004 | 25.8 | 0.12 | bdl | bdl | bdl | 0.40 |
| bdl | 25.6 | 0.10 | bdl | bdl | bdl | 0.29 |
| bdl | 25.6 | 0.10 | bdl | bdl | bdl | 0.28 |
| bdl | 24.9 | 0.10 | bdl | bdl | bdl | 0.32 |
| bdl | 26.0 | 0.18 | bdl | bdl | bdl | 0.56 |
| bdl | 24.7 | 0.15 | bdl | bdl | bdl | 0.42 |
| bdl | 24.1 | 0.13 | bdl | bdl | bdl | 0.36 |
| bdl | 23.5 | 0.14 | bdl | bdl | bdl | 0.38 |
| bdl | 23.7 | 0.19 | bdl | bdl | bdl | 0.48 |
| 0.007 | 23.4 | 0.17 | bdl | bdl | bdl | 0.44 |
| bdl | 22.7 | 0.12 | bdl | bdl | bdl | 0.32 |
| bdl | 21.9 | 0.11 | bdl | bdl | bdl | 0.33 |
| 0.019 | 27.0 | 0.12 | bdl | bdl | bdl | 0.30 |
| 0.003 | 27.1 | 0.25 | bdl | bdl | bdl | 0.57 |
| 0.001 | 25.5 | 0.15 | bdl | bdl | bdl | 0.33 |
| 0.011 | 24.2 | 0.11 | bdl | bdl | bdl | 0.26 |
| bdl | 23.9 | 0.20 | bdl | bdl | bdl | 0.39 |
| bdl | 21.7 | 0.12 | bdl | bdl | bdl | 0.21 |
| 0.007 | 21.1 | 0.11 | bdl | bdl | bdl | 0.19 |
| bdl | 21.7 | 0.12 | bdl | bdl | bdl | 0.20 |
| 0.008 | 21.7 | 0.13 | bdl | bdl | bdl | 0.24 |
| bdl | 18.2 | 0.12 | bdl | bdl | bdl | 0.20 |
| 0.001 | 18.1 | 0.12 | bdl | bdl | bdl | 0.18 |
| 0.006 | 18.1 | 0.10 | bdl | bdl | bdl | 0.16 |
| 0.002 | 18.1 | 0.10 | bdl | bdl | bdl | 0.16 |
| bdl | 26.8 | 0.12 | bdl | bdl | bdl | 0.37 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Arrieros/LB Ore mixed culture | 2 | bdl | 0.01 | bdl | bdl | 0.79 |
| Arrieros/LB Ore mixed culture | 3 | bdl | 0.02 | bdl | bdl | 0.77 |
| Arrieros/LB Ore mixed culture | 4 | bdl | 0.01 | bdl | bdl | 0.74 |
| Arrieros/LB Ore mixed culture | 5 | bdl | 0.02 | bdl | bdl | 0.66 |
| Arrieros/LB Ore mixed culture | 6 | bdl | 0.02 | bdl | bdl | 0.58 |
| Arrieros/LB Ore mixed culture | 7 | bdl | 0.03 | bdl | bdl | 0.50 |
| Arrieros/LB Ore mixed culture | 8 | bdl | 0.03 | bdl | bdl | 0.45 |
| Arrieros/LB Ore mixed culture | 9 | bdl | 0.05 | bdl | bdl | 0.42 |
| Arrieros/LB Ore mixed culture | 10 | bdl | 0.02 | bdl | bdl | 0.36 |
| Arrieros/LB Ore mixed culture | 11 | bdl | 0.02 | bdl | bdl | 0.33 |
| Arrieros/LB Ore mixed culture | 12 | bdl | 0.04 | bdl | bdl | 0.31 |
| Arrieros/LB Ore mixed culture | 13 | bdl | 0.02 | bdl | bdl | 0.29 |
| Arrieros/LB Ore mixed culture | 14 | bdl | 0.02 | bdl | bdl | 0.26 |
| Arrieros/LB Ore mixed culture | 15 | bdl | 0.01 | bdl | bdl | 0.23 |
| Arrieros/LB Ore mixed culture | 16 | bdl | 0.02 | bdl | bdl | 0.24 |
| Arrieros/LB Ore mixed culture | 17 | bdl | 0.04 | bdl | bdl | 0.23 |
| Arrieros/LB Ore mixed culture | 18 | bdl | 0.03 | bdl | bdl | 0.20 |
| Arrieros/LB Ore mixed culture | 19 | bdl | 0.02 | bdl | bdl | 0.18 |
| Arrieros/LB Ore mixed culture | 20 | bdl | 0.03 | bdl | bdl | 0.15 |
| Arrieros/LB Ore mixed culture | 21 | bdl | 0.01 | bdl | bdl | 0.14 |
| Arrieros/LB Ore mixed culture | 22 | bdl | 0.01 | bdl | bdl | 0.12 |
| Arrieros/LB Ore mixed culture | 23 | bdl | 0.02 | bdl | bdl | 0.10 |
| Arrieros/LB Ore mixed culture | 24 | bdl | 0.02 | bdl | bdl | 0.11 |
| Arrieros/LB Ore mixed culture | 25 | bdl | 0.03 | bdl | bdl | 0.09 |
| Arrieros/LB Ore mixed culture | 26 | bdl | 0.02 | bdl | bdl | 0.09 |
| Arrieros/LB Ore mixed culture | 27 | bdl | 0.02 | bdl | bdl | 0.09 |
| Arrieros/LB Ore mixed culture | 28 | bdl | 0.04 | bdl | bdl | 0.10 |
| Raglan Ore control | 1 | bdl | bdl | bdl | bdl | 0.61 |
| Raglan Ore control | 2 | bdl | 0.00 | bdl | bdl | 0.58 |
| Raglan Ore control | 3 | bdl | bdl | bdl | bdl | 0.53 |
| Raglan Ore control | 4 | bdl | 0.02 | bdl | bdl | 0.51 |
| Raglan Ore control | 5 | bdl | 0.00 | bdl | bdl | 0.53 |
| Raglan Ore control | 6 | bdl | bdl | bdl | bdl | 0.50 |
| Raglan Ore control | 7 | bdl | 0.00 | bdl | bdl | 0.42 |
| Raglan Ore control | 8 | bdl | 0.04 | bdl | bdl | 0.37 |
| Raglan Ore control | 9 | bdl | 0.01 | bdl | bdl | 0.37 |
| Raglan Ore control | 10 | bdl | 0.00 | bdl | bdl | 0.35 |
| Raglan Ore control | 11 | bdl | bdl | bdl | bdl | 0.32 |
| Raglan Ore control | 12 | bdl | 0.00 | bdl | bdl | 0.30 |
| Raglan Ore control | 13 | bdl | 0.00 | bdl | bdl | 0.29 |
| Raglan Ore control | 14 | bdl | 0.00 | bdl | bdl | 0.27 |
| Raglan Ore control | 15 | bdl | 0.01 | bdl | bdl | 0.25 |
| Raglan Ore control | 16 | bdl | 0.00 | bdl | bdl | 0.25 |
| Raglan Ore control | 17 | bdl | 0.01 | bdl | bdl | 0.22 |
| Raglan Ore control | 18 | bdl | 0.01 | bdl | bdl | 0.23 |
| Raglan Ore control | 19 | bdl | 0.01 | bdl | bdl | 0.21 |
| Raglan Ore control | 20 | bdl | 0.01 | bdl | bdl | 0.18 |
| Raglan Ore control | 21 | bdl | 0.01 | bdl | bdl | 0.17 |
| Raglan Ore control | 22 | bdl | 0.01 | bdl | bdl | 0.16 |
| Raglan Ore control | 23 | bdl | 0.00 | bdl | bdl | 0.16 |
| Raglan Ore control | 24 | bdl | bdl | bdl | bdl | 0.15 |
| Raglan Ore control | 25 | bdl | 0.01 | bdl | bdl | 0.14 |
| Raglan Ore control | 26 | bdl | 0.00 | bdl | bdl | 0.13 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.04 | 5 | bdl | bdl | bdl | 6.7 | 0.01 | 47 | 0.10 |
| 0.04 | 4 | bdl | bdl | bdl | 6.6 | 0.01 | 44 | 0.10 |
| 0.04 | 4 | bdl | bdl | bdl | 6.3 | 0.01 | 42 | 0.09 |
| 0.04 | 4 | bdl | bdl | bdl | 6.2 | 0.02 | 40 | 0.08 |
| 0.04 | 4 | bdl | bdl | bdl | 5.9 | 0.02 | 38 | 0.07 |
| 0.04 | 5 | bdl | bdl | bdl | 6.3 | 0.03 | Sat | 0.07 |
| 0.06 | 7 | bdl | bdl | bdl | 9.1 | 0.02 | Sat | 0.09 |
| 0.05 | 8 | bdl | bdl | bdl | 8.6 | 0.03 | 50 | 0.08 |
| 0.03 | 6 | bdl | bdl | bdl | 6.3 | 0.01 | 37 | 0.06 |
| 0.04 | 7 | bdl | bdl | bdl | 6.9 | 0.01 | 39 | 0.06 |
| 0.05 | 9 | bdl | bdl | bdl | 8.1 | 0.02 | 43 | 0.07 |
| 0.04 | 8 | bdl | bdl | bdl | 7.1 | 0.02 | 39 | 0.06 |
| 0.04 | 6 | bdl | bdl | bdl | 5.2 | 0.02 | 29 | 0.05 |
| 0.04 | 5 | bdl | bdl | bdl | 5.0 | 0.03 | 27 | 0.04 |
| 0.04 | 5 | bdl | bdl | bdl | 5.3 | 0.02 | 27 | 0.04 |
| 0.08 | 12 | bdl | bdl | bdl | 8.9 | 0.03 | 43 | 0.05 |
| 0.04 | 8 | bdl | bdl | bdl | 5.6 | 0.03 | 30 | 0.04 |
| 0.04 | 5 | bdl | bdl | bdl | 4.2 | 0.06 | 24 | 0.03 |
| 0.08 | 9 | bdl | bdl | bdl | 6.0 | 0.03 | 34 | 0.03 |
| 0.04 | 6 | bdl | bdl | bdl | 3.3 | 0.02 | 24 | 0.02 |
| 0.05 | 5 | bdl | bdl | bdl | 3.0 | 0.02 | 20 | 0.02 |
| 0.06 | 5 | bdl | bdl | bdl | 1.9 | 0.14 | 19 | 0.01 |
| 0.07 | 6 | bdl | bdl | bdl | 2.8 | 0.11 | 22 | 0.02 |
| 0.06 | 6 | bdl | bdl | bdl | 2.5 | 0.07 | 21 | 0.01 |
| 0.06 | 5 | bdl | bdl | bdl | 2.2 | 0.05 | 20 | 0.01 |
| 0.05 | 5 | bdl | bdl | bdl | 2.1 | 0.03 | 18 | 0.01 |
| 0.05 | 5 | bdl | bdl | bdl | 2.1 | 0.04 | 18 | 0.01 |
| 0.01 | 2.9 | bdl | 0.42 | bdl | 0.123 | 37.0 | 3.2 | 0.03 |
| 0.01 | 2.5 | bdl | 0.29 | bdl | 0.008 | 27.9 | 3.1 | 0.02 |
| 0.01 | 2.2 | bdl | 0.22 | bdl | 0.026 | 23.6 | 3.3 | 0.02 |
| 0.01 | 2.2 | bdl | 0.28 | bdl | 0.024 | 19.3 | 3.4 | 0.02 |
| 0.01 | 2.1 | bdl | 0.22 | bdl | 0.007 | 18.3 | 2.9 | 0.02 |
| 0.01 | 2.0 | bdl | 0.23 | bdl | 0.010 | 15.0 | 2.7 | 0.02 |
| 0.01 | 2.0 | bdl | 0.20 | bdl | 0.019 | 16.9 | 3.0 | 0.02 |
| 0.01 | 2.7 | bdl | 0.18 | bdl | 0.010 | 17.1 | 4.6 | 0.02 |
| 0.01 | 2.0 | bdl | 0.15 | bdl | 0.013 | 12.7 | 4.9 | 0.01 |
| 0.01 | 1.7 | bdl | 0.12 | bdl | 0.014 | 9.4 | 4.7 | 0.01 |
| 0.01 | 1.8 | bdl | 0.14 | bdl | 0.011 | 11.1 | 6.3 | 0.01 |
| 0.01 | 2.0 | bdl | 0.13 | bdl | 0.009 | 12.4 | 9.0 | 0.01 |
| 0.01 | 1.9 | bdl | 0.10 | bdl | 0.016 | 10.1 | 10.1 | 0.01 |
| 0.01 | 1.2 | bdl | 0.09 | bdl | 0.024 | 6.0 | 9.6 | 0.01 |
| 0.00 | 1.2 | bdl | 0.09 | bdl | 0.015 | 4.9 | 9.8 | 0.01 |
| 0.01 | 1.2 | bdl | 0.09 | bdl | 0.008 | 5.3 | 10.9 | 0.01 |
| 0.01 | 2.7 | bdl | 0.09 | bdl | 0.010 | 8.8 | 22.1 | 0.01 |
| 0.00 | 1.2 | bdl | 0.06 | bdl | 0.005 | 2.8 | 15.0 | 0.01 |
| 0.00 | 1.0 | bdl | 0.07 | bdl | 0.016 | 2.3 | 13.9 | 0.00 |
| 0.02 | 2.4 | bdl | 0.12 | bdl | 0.026 | 4.2 | 24.4 | 0.01 |
| 0.00 | 1.1 | bdl | 0.08 | bdl | 0.021 | 0.7 | 15.9 | 0.00 |
| 0.00 | 1.3 | bdl | 0.07 | bdl | 0.009 | 0.5 | 14.8 | 0.00 |
| 0.00 | 1.5 | bdl | 0.07 | bdl | 0.007 | 0.3 | 15.8 | 0.00 |
| 0.00 | 1.8 | bdl | 0.07 | bdl | 0.006 | 0.5 | 16.8 | 0.00 |
| 0.00 | 1.8 | bdl | 0.07 | bdl | 0.006 | 0.5 | 16.2 | 0.00 |
| 0.00 | 1.5 | bdl | 0.07 | bdl | 0.006 | 0.5 | 14.6 | 0.00 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 1.4 | 0.46 | 0.03 | 16 | 0.013 | bdl | 0.015 | 25 | bdl |
| 1.5 | 0.46 | 0.03 | 16 | 0.009 | bdl | 0.011 | 23 | bdl |
| 1.5 | 0.46 | 0.04 | 17 | 0.009 | bdl | 0.009 | 23 | bdl |
| 1.5 | 0.48 | 0.04 | 17 | 0.008 | bdl | 0.006 | 22 | bdl |
| 1.5 | 0.47 | 0.04 | 16 | 0.024 | bdl | 0.012 | 21 | bdl |
| 1.7 | 0.52 | 0.03 | 17 | 0.010 | bdl | 0.010 | 18 | bdl |
| 3.0 | 0.94 | 0.03 | 36 | 0.014 | bdl | 0.013 | 18 | bdl |
| 3.3 | 1.03 | 0.04 | 41 | 0.017 | bdl | 0.015 | 26 | bdl |
| 2.6 | 0.81 | 0.04 | 28 | 0.012 | bdl | 0.012 | 26 | bdl |
| 3.1 | 0.95 | 0.04 | 26 | 0.015 | bdl | 0.015 | 21 | bdl |
| 4.4 | 1.30 | 0.03 | 36 | 0.018 | bdl | 0.015 | 19 | bdl |
| 4.1 | 1.21 | 0.04 | 39 | 0.017 | bdl | 0.012 | 22 | bdl |
| 3.0 | 0.86 | 0.04 | 28 | 0.015 | bdl | 0.016 | 22 | bdl |
| 2.7 | 0.78 | 0.04 | 22 | 0.010 | bdl | 0.007 | 20 | bdl |
| 2.9 | 0.83 | 0.04 | 67 | 0.010 | bdl | 0.013 | 21 | bdl |
| 7.1 | 1.84 | 0.03 | 142 | 0.026 | bdl | 0.010 | 17 | bdl |
| 5.1 | 1.22 | 0.05 | 116 | 0.021 | bdl | 0.007 | 28 | bdl |
| 3.5 | 0.79 | 0.04 | 62 | 0.143 | bdl | 0.008 | 20 | bdl |
| 6.5 | 1.32 | 0.03 | 129 | 0.017 | bdl | 0.011 | 16 | bdl |
| 4.5 | 0.77 | 0.06 | 88 | 0.013 | bdl | 0.002 | 24 | bdl |
| 3.5 | 0.56 | 0.05 | 55 | 0.012 | bdl | bdl | 18 | bdl |
| 3.7 | 0.54 | 0.03 | 50 | 0.018 | bdl | 0.000 | 15 | bdl |
| 4.7 | 0.68 | 0.03 | 66 | 0.007 | bdl | 0.009 | 15 | bdl |
| 4.5 | 0.63 | 0.04 | 22 | 0.006 | bdl | 0.003 | 13 | bdl |
| 4.2 | 0.57 | 0.04 | 22 | 0.005 | bdl | 0.004 | 14 | bdl |
| 3.8 | 0.50 | 0.05 | 21 | 0.005 | bdl | 0.002 | 15 | bdl |
| 3.7 | 0.50 | 0.05 | 21 | 0.005 | bdl | 0.003 | 15 | bdl |
| 41.9 | 0.49 | bdl | 12 | 37 | bdl | bdl | 100 | bdl |
| 36.9 | 0.42 | bdl | 12 | 31 | bdl | bdl | 90 | bdl |
| 32.8 | 0.37 | bdl | 13 | 25 | bdl | bdl | 77 | bdl |
| 30.9 | 0.35 | bdl | 13 | 25 | bdl | bdl | 73 | bdl |
| 30.3 | 0.34 | bdl | 13 | 23 | bdl | 0.002 | 71 | bdl |
| 27.6 | 0.31 | bdl | 13 | 21 | bdl | bdl | 64 | bdl |
| 28.0 | 0.31 | bdl | 17 | 20 | bdl | 0.000 | 56 | bdl |
| 33.8 | 0.36 | bdl | 30 | 20 | bdl | bdl | 55 | bdl |
| 29.0 | 0.31 | bdl | 34 | 17 | bdl | 0.005 | 67 | bdl |
| 22.5 | 0.24 | bdl | 26 | 13 | bdl | bdl | 58 | bdl |
| 24.9 | 0.27 | bdl | 26 | 14 | bdl | bdl | 47 | bdl |
| 27.8 | 0.29 | bdl | 34 | 15 | bdl | 0.002 | 45 | bdl |
| 23.8 | 0.25 | bdl | 34 | 12 | bdl | 0.000 | 49 | bdl |
| 17.2 | 0.17 | bdl | 26 | 9 | bdl | 0.002 | 44 | bdl |
| 15.6 | 0.16 | bdl | 22 | 8 | bdl | 0.004 | 40 | bdl |
| 15.9 | 0.16 | bdl | 66 | 8 | bdl | bdl | 41 | bdl |
| 29.3 | 0.27 | bdl | 142 | 11 | bdl | bdl | 39 | bdl |
| 14.9 | 0.14 | bdl | 93 | 6 | bdl | bdl | 44 | bdl |
| 12.3 | 0.11 | bdl | 62 | 6 | bdl | bdl | 33 | bdl |
| 24.2 | 0.20 | bdl | 139 | 10 | bdl | bdl | 38 | bdl |
| 11.4 | 0.09 | bdl | 77 | 5 | bdl | bdl | 35 | bdl |
| 11.0 | 0.08 | bdl | 56 | 5 | bdl | bdl | 28 | bdl |
| 12.1 | 0.09 | bdl | 60 | 5 | bdl | bdl | 27 | bdl |
| 13.7 | 0.10 | bdl | 68 | 5 | bdl | bdl | 26 | bdl |
| 13.2 | 0.09 | bdl | 22 | 5 | bdl | 0.002 | 26 | bdl |
| 12.0 | 0.09 | bdl | 21 | 4 | bdl | bdl | 26 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.002 | 23.3 | 0.10 | bdl | bdl | bdl | 0.29 |
| 0.005 | 23.7 | 0.10 | bdl | bdl | bdl | 0.31 |
| bdl | 23.9 | 0.10 | bdl | bdl | bdl | 0.28 |
| 0.019 | 24.7 | 0.10 | bdl | bdl | bdl | 0.28 |
| bdl | 24.5 | 0.10 | bdl | bdl | bdl | 0.27 |
| bdl | 23.8 | 0.10 | bdl | bdl | bdl | 0.56 |
| 0.018 | 24.3 | 0.18 | bdl | bdl | bdl | 0.46 |
| 0.005 | 25.3 | 0.18 | bdl | bdl | bdl | 0.48 |
| 0.001 | 23.3 | 0.13 | bdl | bdl | bdl | 0.35 |
| 0.006 | 23.1 | 0.15 | bdl | bdl | bdl | 0.40 |
| bdl | 23.2 | 0.20 | bdl | bdl | bdl | 0.50 |
| bdl | 23.1 | 0.18 | bdl | bdl | bdl | 0.45 |
| bdl | 21.9 | 0.13 | bdl | bdl | bdl | 0.33 |
| bdl | 21.5 | 0.12 | bdl | bdl | bdl | 0.29 |
| bdl | 26.0 | 0.12 | bdl | bdl | bdl | 0.31 |
| 0.011 | 26.6 | 0.27 | bdl | bdl | bdl | 0.58 |
| 0.006 | 25.5 | 0.17 | bdl | bdl | bdl | 0.37 |
| 0.014 | 23.9 | 0.12 | bdl | bdl | bdl | 0.25 |
| 0.023 | 23.6 | 0.21 | bdl | bdl | bdl | 0.38 |
| 0.018 | 22.0 | 0.13 | bdl | bdl | bdl | 0.20 |
| bdl | 21.0 | 0.10 | bdl | bdl | bdl | 0.17 |
| 0.008 | 18.6 | 0.10 | bdl | bdl | bdl | 0.14 |
| 0.007 | 19.8 | 0.13 | bdl | bdl | bdl | 0.18 |
| 0.011 | 17.3 | 0.12 | bdl | bdl | bdl | 0.16 |
| 0.007 | 16.9 | 0.11 | bdl | bdl | bdl | 0.16 |
| bdl | 17.0 | 0.10 | bdl | bdl | bdl | 0.12 |
| bdl | 17.0 | 0.10 | bdl | bdl | bdl | 0.13 |
| bdl | 19.0 | 0.015 | bdl | bdl | 0.012 | 0.22 |
| bdl | 17.2 | 0.013 | bdl | bdl | 0.009 | 0.18 |
| bdl | 17.0 | 0.012 | bdl | bdl | 0.007 | 0.15 |
| bdl | 17.4 | 0.011 | bdl | bdl | 0.007 | 0.15 |
| bdl | 17.4 | 0.011 | bdl | bdl | 0.005 | 0.14 |
| bdl | 17.6 | 0.010 | bdl | bdl | 0.004 | 0.14 |
| bdl | 17.2 | 0.010 | bdl | bdl | 0.003 | 0.13 |
| bdl | 17.2 | 0.013 | bdl | bdl | 0.005 | 0.13 |
| bdl | 17.8 | 0.010 | bdl | bdl | 0.001 | 0.10 |
| bdl | 16.5 | 0.008 | bdl | bdl | 0.000 | 0.09 |
| bdl | 16.6 | 0.009 | bdl | bdl | 0.001 | 0.09 |
| bdl | 17.1 | 0.010 | bdl | bdl | 0.001 | 0.09 |
| bdl | 16.6 | 0.008 | bdl | bdl | 0.000 | 0.08 |
| bdl | 15.9 | 0.006 | bdl | bdl | 0.000 | 0.06 |
| bdl | 15.5 | 0.005 | bdl | bdl | bdl | 0.06 |
| bdl | 19.6 | 0.005 | bdl | bdl | 0.002 | 0.07 |
| bdl | 20.3 | 0.009 | bdl | bdl | 0.006 | 0.08 |
| bdl | 19.8 | 0.005 | bdl | bdl | 0.002 | 0.05 |
| bdl | 19.2 | 0.004 | bdl | bdl | 0.001 | 0.04 |
| bdl | 20.1 | 0.007 | bdl | bdl | 0.003 | 0.06 |
| bdl | 17.4 | 0.003 | bdl | bdl | 0.002 | 0.03 |
| bdl | 17.5 | 0.003 | bdl | bdl | 0.003 | 0.03 |
| bdl | 17.8 | 0.004 | bdl | bdl | 0.003 | 0.05 |
| bdl | 17.6 | 0.004 | bdl | bdl | 0.004 | 0.04 |
| bdl | 15.6 | 0.004 | bdl | bdl | 0.000 | 0.04 |
| bdl | 14.8 | 0.003 | bdl | bdl | bdl | 0.04 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Raglan Ore control | 27 | bdl | 0.00 | bdl | bdl | 0.14 |
| Raglan Ore control | 28 | bdl | 0.01 | bdl | bdl | 0.14 |
| Raglan Ore mixed culture | 1 | bdl | 0.03 | bdl | bdl | 0.51 |
| Raglan Ore mixed culture | 2 | bdl | bdl | bdl | bdl | 0.54 |
| Raglan Ore mixed culture | 3 | bdl | 0.00 | bdl | bdl | 0.51 |
| Raglan Ore mixed culture | 4 | bdl | bdl | bdl | bdl | 0.50 |
| Raglan Ore mixed culture | 5 | bdl | bdl | bdl | bdl | 0.45 |
| Raglan Ore mixed culture | 6 | bdl | 0.00 | bdl | bdl | 0.41 |
| Raglan Ore mixed culture | 7 | bdl | 0.00 | bdl | bdl | 0.37 |
| Raglan Ore mixed culture | 8 | bdl | bdl | bdl | bdl | 0.34 |
| Raglan Ore mixed culture | 9 | bdl | bdl | bdl | bdl | 0.33 |
| Raglan Ore mixed culture | 10 | bdl | bdl | bdl | bdl | 0.32 |
| Raglan Ore mixed culture | 11 | bdl | bdl | bdl | bdl | 0.31 |
| Raglan Ore mixed culture | 12 | bdl | 0.01 | bdl | bdl | 0.28 |
| Raglan Ore mixed culture | 13 | bdl | bdl | bdl | bdl | 0.27 |
| Raglan Ore mixed culture | 14 | bdl | 0.00 | bdl | bdl | 0.26 |
| Raglan Ore mixed culture | 15 | bdl | 0.00 | bdl | bdl | 0.24 |
| Raglan Ore mixed culture | 16 | bdl | 0.01 | bdl | bdl | 0.25 |
| Raglan Ore mixed culture | 17 | bdl | 0.00 | bdl | bdl | 0.21 |
| Raglan Ore mixed culture | 18 | bdl | 0.00 | bdl | bdl | 0.22 |
| Raglan Ore mixed culture | 19 | bdl | 0.00 | bdl | bdl | 0.21 |
| Raglan Ore mixed culture | 20 | bdl | 0.00 | bdl | bdl | 0.17 |
| Raglan Ore mixed culture | 21 | bdl | 0.01 | bdl | bdl | 0.17 |
| Raglan Ore mixed culture | 22 | bdl | 0.00 | bdl | bdl | 0.16 |
| Raglan Ore mixed culture | 23 | bdl | 0.01 | bdl | bdl | 0.13 |
| Raglan Ore mixed culture | 24 | bdl | 0.01 | bdl | bdl | 0.14 |
| Raglan Ore mixed culture | 25 | bdl | 0.00 | bdl | bdl | 0.12 |
| Raglan Ore mixed culture | 26 | bdl | 0.00 | bdl | bdl | 0.12 |
| Raglan Ore mixed culture | 27 | bdl | 0.00 | bdl | bdl | 0.12 |
| Raglan Ore mixed culture | 28 | bdl | 0.02 | bdl | bdl | 0.13 |
| Talbot/T7 Ore mixed culture | 1 | bdl | bdl | bdl | bdl | 0.02 |
| Talbot/T7 Ore mixed culture | 2 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 3 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 4 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 5 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 6 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 7 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 8 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 9 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 10 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 11 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 12 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 13 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 14 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 15 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 16 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 17 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 18 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 22 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Ore mixed culture | 23 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Ore mixed culture | 24 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 25 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 26 | bdl | bdl | bdl | bdl | 0.06 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.00 | 1.4 | bdl | 0.06 | bdl | 0.008 | 0.2 | 14.2 | 0.00 |
| 0.00 | 1.2 | bdl | 0.07 | bdl | 0.013 | 0.3 | 12.8 | 0.00 |
| 0.01 | 4.3 | bdl | 0.58 | bdl | 0.019 | 66.7 | 4.3 | 0.04 |
| 0.01 | 3.5 | bdl | 0.36 | bdl | 0.006 | 47.6 | 4.0 | 0.03 |
| 0.01 | 2.9 | bdl | 0.26 | bdl | 0.009 | 39.9 | 3.6 | 0.03 |
| 0.01 | 2.7 | bdl | 0.21 | bdl | 0.003 | 32.0 | 3.6 | 0.02 |
| 0.01 | 2.4 | bdl | 0.17 | bdl | 0.005 | 25.9 | 3.5 | 0.02 |
| 0.01 | 1.9 | bdl | 0.14 | bdl | 0.003 | 20.6 | 3.4 | 0.02 |
| 0.01 | 3.4 | bdl | 0.15 | bdl | 0.036 | 21.8 | 4.3 | 0.02 |
| 0.02 | 2.5 | bdl | 0.15 | bdl | 0.006 | 22.0 | 5.8 | 0.02 |
| 0.01 | 2.4 | bdl | 0.12 | bdl | 0.003 | 20.5 | 6.6 | 0.02 |
| 0.01 | 1.9 | bdl | 0.11 | bdl | 0.007 | 13.8 | 6.3 | 0.01 |
| 0.01 | 2.2 | bdl | 0.12 | bdl | 0.004 | 14.9 | 7.8 | 0.01 |
| 0.01 | 2.1 | bdl | 0.13 | bdl | 0.004 | 15.7 | 10.5 | 0.01 |
| 0.01 | 1.9 | bdl | 0.11 | bdl | 0.018 | 13.2 | 11.1 | 0.01 |
| 0.01 | 1.6 | bdl | 0.09 | bdl | 0.006 | 8.4 | 10.4 | 0.01 |
| 0.01 | 1.2 | bdl | 0.09 | bdl | 0.007 | 7.2 | 10.2 | 0.01 |
| 0.01 | 1.5 | bdl | 0.10 | bdl | 0.006 | 7.2 | 11.5 | 0.01 |
| 0.01 | 2.4 | bdl | 0.12 | bdl | 0.005 | 10.7 | 19.8 | 0.01 |
| 0.01 | 1.4 | bdl | 0.09 | bdl | 0.004 | 4.4 | 16.2 | 0.01 |
| 0.00 | 1.4 | bdl | 0.09 | bdl | 0.024 | 3.6 | 14.8 | 0.01 |
| 0.01 | 1.8 | bdl | 0.12 | bdl | 0.007 | 6.3 | 21.6 | 0.01 |
| 0.00 | 1.2 | bdl | 0.08 | bdl | 0.008 | 2.2 | 17.0 | 0.00 |
| 0.00 | 0.9 | bdl | 0.09 | bdl | 0.003 | 2.0 | 14.8 | 0.00 |
| 0.01 | 1.8 | bdl | 0.11 | bdl | 0.016 | 1.5 | 14.4 | 0.00 |
| 0.01 | 1.9 | bdl | 0.18 | bdl | 0.023 | 2.2 | 16.6 | 0.00 |
| 0.01 | 1.7 | bdl | 0.17 | bdl | 0.014 | 2.2 | 15.2 | 0.00 |
| 0.00 | 1.5 | bdl | 0.17 | bdl | 0.013 | 2.0 | 14.4 | 0.00 |
| 0.00 | 1.6 | bdl | 0.17 | bdl | 0.011 | 2.0 | 14.5 | 0.00 |
| 0.00 | 1.5 | bdl | 0.15 | bdl | 0.009 | 2.0 | 14.1 | 0.00 |
| 0.07 | 268 | bdl | 0.00 | bdl | 0.002 | 0.18 | 12.5 | 0.01 |
| 0.12 | 536 | bdl | 0.02 | bdl | 0.029 | 0.04 | 30.7 | 0.02 |
| 0.10 | 546 | bdl | 0.03 | bdl | 0.039 | 0.07 | 33.8 | 0.02 |
| 0.09 | 557 | bdl | 0.03 | bdl | 0.038 | 0.05 | 34.9 | 0.02 |
| 0.07 | 545 | bdl | 0.03 | bdl | 0.045 | 0.02 | 33.8 | 0.02 |
| 0.06 | 503 | bdl | 0.03 | bdl | 0.034 | 0.01 | 30.5 | 0.02 |
| 0.06 | 450 | bdl | 0.03 | bdl | 0.029 | 0.02 | 27.1 | 0.11 |
| 0.06 | 428 | bdl | 0.02 | bdl | 0.030 | 0.02 | 24.8 | 0.10 |
| 0.05 | 394 | bdl | 0.02 | bdl | 0.028 | 0.02 | 22.0 | 0.09 |
| 0.05 | 386 | bdl | 0.01 | bdl | 0.036 | 0.02 | 21.0 | 0.09 |
| 0.05 | 376 | bdl | 0.01 | bdl | 0.031 | 0.09 | 20.6 | 0.09 |
| 0.05 | 357 | bdl | 0.01 | bdl | 0.031 | 0.03 | 19.5 | 0.08 |
| 0.05 | 351 | bdl | 0.01 | bdl | 0.038 | 0.04 | 18.5 | 0.08 |
| 0.05 | 350 | bdl | 0.01 | bdl | 0.032 | 0.03 | 19.2 | 0.08 |
| 0.05 | 338 | bdl | 0.01 | bdl | 0.025 | 0.01 | 20.5 | 0.07 |
| 0.05 | 336 | bdl | 0.01 | bdl | 0.026 | 0.06 | 20.9 | 0.07 |
| 0.05 | 323 | bdl | 0.01 | bdl | 0.027 | 0.02 | 19.2 | 0.07 |
| 0.05 | 314 | bdl | bdl | bdl | 0.023 | 0.03 | 18.0 | 0.06 |
| 0.05 | 286 | bdl | bdl | bdl | 0.024 | 0.05 | 15.0 | 0.05 |
| 0.05 | 279 | bdl | 0.01 | bdl | 0.024 | 0.07 | 14.6 | 0.04 |
| 0.05 | 272 | bdl | bdl | bdl | 0.022 | 0.02 | 14.0 | 0.04 |
| 0.05 | 254 | bdl | bdl | bdl | 0.020 | 0.02 | 13.3 | 0.04 |
| 0.05 | 251 | bdl | bdl | bdl | 0.018 | 0.04 | 13.3 | 0.04 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 11.2 | 0.08 | bdl | 21 | 4 | bdl | 0.002 | 28 | bdl |
| 10.0 | 0.07 | bdl | 19 | 4 | bdl | 0.002 | 28 | bdl |
| 64.2 | 0.79 | bdl | 12 | 68 | bdl | bdl | 167 | bdl |
| 50.4 | 0.61 | bdl | 12 | 48 | bdl | bdl | 127 | bdl |
| 42.5 | 0.51 | bdl | 12 | 38 | bdl | bdl | 104 | bdl |
| 36.8 | 0.44 | bdl | 13 | 32 | bdl | bdl | 91 | bdl |
| 31.2 | 0.37 | bdl | 13 | 25 | bdl | bdl | 76 | bdl |
| 26.9 | 0.32 | bdl | 14 | 21 | bdl | 0.002 | 65 | bdl |
| 28.6 | 0.33 | bdl | 19 | 21 | bdl | bdl | 58 | bdl |
| 31.2 | 0.36 | bdl | 29 | 22 | bdl | bdl | 61 | bdl |
| 29.1 | 0.33 | bdl | 31 | 20 | bdl | 0.001 | 66 | bdl |
| 23.9 | 0.27 | bdl | 26 | 16 | bdl | bdl | 60 | bdl |
| 24.4 | 0.28 | bdl | 26 | 16 | bdl | bdl | 53 | bdl |
| 26.3 | 0.30 | bdl | 32 | 17 | bdl | 0.002 | 49 | bdl |
| 23.5 | 0.27 | bdl | 34 | 15 | bdl | bdl | 51 | bdl |
| 17.8 | 0.20 | bdl | 27 | 11 | bdl | 0.001 | 47 | bdl |
| 15.9 | 0.18 | bdl | 23 | 10 | bdl | 0.002 | 42 | bdl |
| 16.2 | 0.18 | bdl | 68 | 10 | bdl | 0.001 | 43 | bdl |
| 26.2 | 0.28 | bdl | 128 | 14 | bdl | bdl | 42 | bdl |
| 16.9 | 0.18 | bdl | 106 | 9 | bdl | 0.004 | 50 | bdl |
| 13.0 | 0.14 | bdl | 66 | 8 | bdl | bdl | 39 | bdl |
| 20.3 | 0.20 | bdl | 109 | 11 | bdl | 0.002 | 34 | bdl |
| 13.1 | 0.12 | bdl | 92 | 7 | bdl | bdl | 41 | bdl |
| 11.0 | 0.10 | bdl | 57 | 6 | bdl | bdl | 33 | bdl |
| 12.0 | 0.17 | bdl | 54 | 6 | bdl | bdl | 31 | bdl |
| 13.9 | 0.16 | bdl | 67 | 9 | bdl | 0.002 | 33 | bdl |
| 12.7 | 0.13 | bdl | 21 | 9 | bdl | bdl | 29 | bdl |
| 11.9 | 0.12 | bdl | 20 | 8 | bdl | bdl | 30 | bdl |
| 11.8 | 0.11 | bdl | 20 | 8 | bdl | bdl | 31 | bdl |
| 11.5 | 0.11 | bdl | 20 | 8 | bdl | 0.002 | 32 | bdl |
| 5.8 | 2.52 | 0.008 | 9 | 0.001 | bdl | 0.007 | 211 | bdl |
| 17.5 | 6.74 | 0.008 | 14 | 0.002 | bdl | 0.016 | 568 | bdl |
| 20.9 | 6.57 | 0.007 | 13 | 0.007 | bdl | 0.012 | 577 | bdl |
| 23.7 | 6.27 | 0.009 | 14 | 0.004 | bdl | 0.013 | 610 | bdl |
| 24.9 | 5.94 | 0.008 | 14 | 0.005 | bdl | 0.016 | 560 | bdl |
| 22.0 | 5.29 | 0.007 | 12 | 0.003 | bdl | 0.015 | 498 | bdl |
| 19.3 | 4.69 | 0.008 | 12 | 0.004 | bdl | 0.009 | 392 | bdl |
| 16.7 | 4.23 | 0.009 | 11 | 0.003 | bdl | 0.017 | 386 | bdl |
| 14.5 | 3.73 | 0.007 | 12 | 0.001 | bdl | 0.019 | 349 | bdl |
| 14.0 | 3.63 | 0.006 | 12 | 0.003 | bdl | 0.013 | 337 | bdl |
| 13.9 | 3.55 | 0.006 | 12 | 0.001 | bdl | 0.009 | 332 | bdl |
| 13.1 | 3.36 | 0.005 | 11 | 0.002 | bdl | 0.018 | 316 | bdl |
| 12.6 | 3.21 | 0.009 | 11 | 0.001 | bdl | 0.019 | 308 | bdl |
| 12.5 | 3.12 | 0.006 | 13 | 0.001 | bdl | 0.021 | 311 | bdl |
| 12.4 | 2.97 | 0.007 | 18 | 0.001 | bdl | 0.010 | 302 | bdl |
| 12.6 | 2.88 | 0.006 | 19 | 0.001 | bdl | 0.013 | 302 | bdl |
| 12.2 | 2.73 | 0.010 | 18 | 0.001 | bdl | 0.012 | 290 | bdl |
| 11.9 | 2.58 | 0.009 | 16 | 0.002 | bdl | 0.014 | 286 | bdl |
| 10.7 | 2.09 | 0.008 | 7 | 0.005 | bdl | 0.009 | 234 | bdl |
| 10.5 | 2.02 | 0.008 | 7 | 0.002 | bdl | 0.011 | 229 | bdl |
| 10.1 | 1.92 | 0.007 | 7 | 0.002 | bdl | 0.008 | 222 | bdl |
| 9.7 | 1.80 | 0.007 | 8 | 0.002 | bdl | 0.012 | 202 | bdl |
| 9.6 | 1.73 | 0.008 | 9 | 0.001 | bdl | 0.007 | 206 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| bdl | 15.1 | 0.003 | bdl | bdl | bdl | 0.03 |
| bdl | 15.1 | 0.003 | bdl | bdl | 0.000 | 0.03 |
| bdl | 18.6 | 0.021 | bdl | bdl | 0.017 | 0.40 |
| bdl | 18.2 | 0.017 | bdl | bdl | 0.013 | 0.30 |
| bdl | 17.2 | 0.015 | bdl | bdl | 0.011 | 0.27 |
| bdl | 17.3 | 0.013 | bdl | bdl | 0.009 | 0.22 |
| bdl | 16.6 | 0.012 | bdl | bdl | 0.006 | 0.16 |
| bdl | 16.4 | 0.010 | bdl | bdl | 0.004 | 0.13 |
| bdl | 16.1 | 0.011 | bdl | bdl | 0.004 | 0.23 |
| bdl | 16.5 | 0.012 | bdl | bdl | 0.003 | 0.14 |
| bdl | 16.8 | 0.011 | bdl | bdl | 0.003 | 0.14 |
| bdl | 16.0 | 0.009 | bdl | bdl | 0.000 | 0.12 |
| bdl | 16.3 | 0.011 | bdl | bdl | 0.001 | 0.11 |
| bdl | 16.3 | 0.010 | bdl | bdl | 0.002 | 0.11 |
| bdl | 16.3 | 0.009 | bdl | bdl | 0.001 | 0.11 |
| bdl | 16.2 | 0.007 | bdl | bdl | bdl | 0.09 |
| bdl | 15.7 | 0.006 | bdl | bdl | bdl | 0.08 |
| bdl | 20.2 | 0.006 | bdl | bdl | 0.003 | 0.09 |
| bdl | 20.7 | 0.009 | bdl | bdl | 0.004 | 0.10 |
| bdl | 20.8 | 0.006 | bdl | bdl | 0.002 | 0.07 |
| bdl | 20.0 | 0.005 | bdl | bdl | 0.001 | 0.07 |
| bdl | 20.2 | 0.007 | bdl | bdl | 0.004 | 0.08 |
| bdl | 19.2 | 0.005 | bdl | bdl | 0.002 | 0.04 |
| bdl | 19.0 | 0.003 | bdl | bdl | 0.003 | 0.06 |
| bdl | 17.6 | 0.005 | bdl | bdl | 0.005 | 0.06 |
| bdl | 18.8 | 0.004 | bdl | bdl | 0.005 | 0.08 |
| bdl | 16.0 | 0.004 | bdl | bdl | bdl | 0.06 |
| bdl | 15.5 | 0.004 | bdl | bdl | bdl | 0.06 |
| bdl | 16.0 | 0.004 | bdl | bdl | 0.000 | 0.06 |
| bdl | 16.4 | 0.004 | bdl | bdl | 0.002 | 0.06 |
| 0.048 | 1.4 | 0.232 | bdl | bdl | bdl | 3.5 |
| 0.100 | 2.5 | 0.449 | bdl | bdl | 0.005 | 13.6 |
| 0.091 | 2.5 | 0.476 | bdl | bdl | 0.003 | 18.6 |
| 0.087 | 2.5 | 0.492 | bdl | bdl | 0.004 | 19.9 |
| 0.087 | 2.4 | 0.481 | bdl | bdl | 0.003 | 20.5 |
| 0.077 | 2.1 | 0.445 | bdl | bdl | 0.004 | 22.7 |
| 0.104 | 2.0 | 0.332 | bdl | bdl | 0.007 | 21.9 |
| 0.098 | 1.9 | 0.309 | bdl | bdl | 0.008 | 24.2 |
| 0.100 | 1.8 | 0.281 | bdl | bdl | 0.004 | 19.5 |
| 0.071 | 1.9 | 0.271 | bdl | bdl | 0.007 | 17.9 |
| 0.076 | 1.8 | 0.264 | bdl | bdl | 0.005 | 19.0 |
| 0.094 | 1.6 | 0.255 | bdl | bdl | bdl | 18.7 |
| 0.073 | 1.5 | 0.244 | bdl | bdl | bdl | 18.1 |
| 0.083 | 1.5 | 0.249 | bdl | bdl | 0.003 | 17.2 |
| 0.065 | 1.5 | 0.240 | bdl | bdl | 0.002 | 16.5 |
| 0.054 | 1.5 | 0.236 | bdl | bdl | 0.002 | 16.8 |
| 0.067 | 1.4 | 0.227 | bdl | bdl | 0.000 | 16.1 |
| 0.075 | 1.4 | 0.219 | bdl | bdl | 0.000 | 15.3 |
| 0.055 | 1.2 | 0.179 | bdl | bdl | 0.006 | 14.6 |
| 0.059 | 1.2 | 0.175 | bdl | bdl | 0.006 | 15.4 |
| 0.044 | 1.2 | 0.169 | bdl | bdl | 0.006 | 14.8 |
| 0.035 | 1.1 | 0.159 | bdl | bdl | 0.007 | 13.2 |
| 0.056 | 1.1 | 0.157 | bdl | bdl | 0.007 | 13.0 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Ore mixed culture | 27 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 28 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Ore mixed culture | 29 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 30 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 31 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 32 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 33 | bdl | bdl | bdl | bdl | 0.05 |
| Talbot/T7 Ore mixed culture | 34 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 35 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 36 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 37 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 38 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 39 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 40 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 41 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 42 | bdl | bdl | bdl | bdl | 0.03 |
| Talbot/T7 Ore mixed culture | 43 | bdl | bdl | bdl | bdl | 0.03 |
| Talbot/T7 Ore mixed culture | 44 | bdl | bdl | bdl | bdl | 0.03 |
| Talbot/T7 Ore mixed culture | 45 | bdl | bdl | bdl | bdl | 0.03 |
| Talbot/T7 Ore mixed culture | 46 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 47 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 48 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 49 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 50 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 53 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 54 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 55 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 56 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Ore mixed culture | 57 | bdl | bdl | bdl | bdl | 0.04 |
| Talbot/T7 Pyrite mixed culture | 1 | bdl | bdl | bdl | bdl | 0.03 |
| Talbot/T7 Pyrite mixed culture | 2 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 3 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 4 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 5 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 6 | bdl | bdl | bdl | bdl | 0.08 |
| Talbot/T7 Pyrite mixed culture | 7 | | | | | |
| Talbot/T7 Pyrite mixed culture | 8 | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 Pyrite mixed culture | 9 | bdl | bdl | bdl | bdl | 0.09 |
| Talbot/T7 Pyrite mixed culture | 10 | bdl | bdl | bdl | bdl | 0.08 |
| Talbot/T7 Pyrite mixed culture | 11 | bdl | bdl | bdl | bdl | 0.08 |
| Talbot/T7 Pyrite mixed culture | 12 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 13 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 14 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 15 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 16 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 17 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 18 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 19 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 20 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 21 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 22 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 23 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 24 | bdl | bdl | bdl | bdl | 0.07 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.05 | 243 | bdl | bdl | bdl | 0.019 | 0.04 | 13.0 | 0.04 |
| 0.05 | 239 | bdl | bdl | bdl | 0.011 | 0.01 | 13.2 | 0.04 |
| 0.04 | 218 | bdl | bdl | bdl | 0.016 | 0.04 | 12.2 | 0.03 |
| 0.05 | 209 | bdl | bdl | bdl | 0.018 | 0.07 | 12.0 | 0.03 |
| 0.05 | 200 | bdl | bdl | bdl | 0.016 | 0.08 | 12.2 | 0.03 |
| 0.05 | 184 | bdl | bdl | bdl | 0.016 | 0.03 | 12.1 | 0.03 |
| 0.05 | 173 | bdl | bdl | bdl | 0.016 | 0.06 | 12.3 | 0.03 |
| 0.05 | 155 | bdl | bdl | bdl | 0.014 | 0.04 | 11.8 | 0.03 |
| 0.05 | 136 | bdl | bdl | bdl | 0.012 | 0.02 | 11.4 | 0.02 |
| 0.05 | 124 | bdl | bdl | bdl | 0.013 | 0.25 | 11.3 | 0.03 |
| 0.05 | 110 | bdl | bdl | bdl | 0.013 | 0.11 | 11.2 | 0.02 |
| 0.05 | 96 | bdl | bdl | bdl | 0.015 | 0.03 | 11.2 | 0.02 |
| 0.05 | 81 | bdl | bdl | bdl | 0.013 | 0.03 | 10.8 | 0.01 |
| 0.05 | 77 | bdl | bdl | bdl | 0.019 | 0.13 | 11.3 | 0.01 |
| 0.05 | 70 | bdl | bdl | bdl | 0.012 | 0.13 | 11.3 | 0.01 |
| 0.05 | 63 | bdl | bdl | bdl | 0.010 | 0.09 | 10.8 | 0.01 |
| 0.05 | 61 | bdl | bdl | bdl | 0.012 | 0.04 | 11.0 | 0.01 |
| 0.05 | 60 | bdl | bdl | bdl | 0.012 | 0.04 | 11.2 | 0.01 |
| 0.06 | 69 | bdl | bdl | bdl | 0.016 | 0.05 | 11.5 | 0.01 |
| 0.06 | 79 | bdl | bdl | bdl | 0.019 | 0.02 | 11.9 | 0.01 |
| 0.06 | 84 | bdl | bdl | bdl | 0.019 | 0.03 | 12.2 | 0.01 |
| 0.06 | 85 | bdl | bdl | bdl | 0.020 | 0.03 | 12.0 | 0.01 |
| 0.06 | 86 | bdl | bdl | bdl | 0.018 | 0.01 | 11.8 | 0.01 |
| 0.06 | 89 | bdl | bdl | bdl | 0.018 | 0.01 | 11.9 | 0.01 |
| 0.05 | 81 | bdl | bdl | bdl | 0.017 | 0.01 | 12.1 | 0.01 |
| 0.05 | 79 | bdl | bdl | bdl | 0.026 | 0.09 | 11.9 | 0.01 |
| 0.05 | 79 | bdl | bdl | bdl | 0.025 | 0.06 | 12.3 | 0.01 |
| 0.05 | 75 | bdl | bdl | bdl | 0.030 | 0.02 | 12.1 | 0.01 |
| 0.05 | 77 | bdl | bdl | bdl | 0.020 | 0.01 | 11.4 | 0.01 |
| 0.05 | 430 | bdl | bdl | bdl | 0.006 | 0.24 | 12.7 | 0.01 |
| 0.05 | 619 | bdl | bdl | bdl | 0.005 | 0.81 | 31.8 | 0.02 |
| 0.04 | 609 | bdl | bdl | bdl | 0.005 | 0.79 | Sat | 0.02 |
| 0.04 | 601 | bdl | bdl | bdl | 0.004 | 0.65 | 31.1 | 0.01 |
| 0.04 | 577 | bdl | bdl | bdl | 0.004 | 0.63 | 28.7 | 0.01 |
| 0.04 | 561 | bdl | bdl | bdl | 0.004 | 0.64 | 27.7 | 0.01 |
| | | | | | | | | |
| 0.04 | 489 | bdl | bdl | bdl | 0.010 | 0.23 | 24.1 | 0.07 |
| 0.04 | 442 | bdl | bdl | bdl | 0.021 | 0.07 | 22.2 | 0.06 |
| 0.04 | 410 | bdl | bdl | bdl | 0.023 | 0.02 | 20.6 | 0.06 |
| 0.04 | 400 | bdl | bdl | bdl | 0.023 | 0.02 | 20.4 | 0.06 |
| 0.04 | 384 | bdl | bdl | bdl | 0.026 | 0.02 | 19.4 | 0.05 |
| 0.04 | 376 | bdl | bdl | bdl | 0.023 | 0.01 | 19.1 | 0.05 |
| 0.04 | 361 | bdl | bdl | bdl | 0.216 | 0.01 | 19.0 | 0.05 |
| 0.04 | 370 | bdl | bdl | bdl | 0.033 | 0.01 | 21.6 | 0.05 |
| 0.04 | 350 | bdl | bdl | bdl | 0.023 | 0.01 | 21.3 | 0.05 |
| 0.04 | 346 | bdl | bdl | bdl | 0.034 | 0.14 | 20.7 | 0.04 |
| 0.04 | 343 | bdl | bdl | bdl | 0.027 | 0.02 | 20.0 | 0.04 |
| 0.04 | 294 | bdl | bdl | bdl | 0.019 | 0.01 | 16.6 | 0.04 |
| 0.05 | 314 | bdl | bdl | bdl | 0.023 | 0.04 | 17.4 | 0.05 |
| 0.05 | 308 | bdl | bdl | bdl | 0.023 | 0.01 | 17.1 | 0.05 |
| 0.05 | 299 | bdl | bdl | bdl | 0.019 | 0.04 | 17.4 | 0.03 |
| 0.05 | 303 | bdl | bdl | bdl | 0.031 | 0.01 | 17.4 | 0.03 |
| 0.05 | 279 | bdl | bdl | bdl | 0.021 | 0.09 | 16.5 | 0.03 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 9.5 | 1.68 | 0.008 | 9 | 0.001 | bdl | 0.010 | 197 | bdl |
| 9.6 | 1.63 | 0.008 | 10 | 0.001 | bdl | 0.014 | 204 | bdl |
| 8.9 | 1.49 | 0.005 | 9 | 0.001 | bdl | 0.012 | 180 | bdl |
| 8.9 | 1.44 | 0.007 | 10 | 0.001 | bdl | 0.005 | 171 | bdl |
| 8.7 | 1.37 | 0.004 | 9 | 0.001 | bdl | 0.010 | 164 | bdl |
| 8.3 | 1.27 | 0.006 | 11 | 0.002 | bdl | 0.010 | 151 | bdl |
| 8.2 | 1.22 | 0.006 | 12 | 0.000 | bdl | 0.008 | 141 | bdl |
| 7.8 | 1.12 | 0.004 | 13 | 0.001 | bdl | 0.010 | 126 | bdl |
| 7.4 | 1.03 | 0.004 | 14 | 0.000 | bdl | 0.008 | 109 | bdl |
| 7.4 | 0.99 | 0.005 | 13 | 0.000 | bdl | 0.007 | 101 | bdl |
| 6.9 | 0.90 | 0.002 | 14 | 0.001 | bdl | 0.299 | 89 | bdl |
| 6.8 | 0.83 | 0.004 | 14 | 0.003 | bdl | 0.014 | 74 | bdl |
| 6.4 | 0.76 | 0.002 | 15 | 0.002 | bdl | 0.004 | 61 | bdl |
| 6.8 | 0.74 | 0.003 | 16 | 0.004 | bdl | 0.012 | 60 | bdl |
| 6.6 | 0.69 | 0.005 | 15 | 0.007 | bdl | 0.008 | 53 | bdl |
| 6.2 | 0.63 | 0.004 | 16 | 0.001 | bdl | 0.008 | 48 | bdl |
| 6.2 | 0.61 | 0.002 | 16 | 0.000 | bdl | 0.008 | 48 | bdl |
| 6.1 | 0.59 | 0.002 | 16 | 0.001 | bdl | 0.003 | 44 | bdl |
| 7.3 | 0.69 | 0.003 | 17 | 0.000 | bdl | 0.008 | 57 | bdl |
| 8.4 | 0.90 | 0.003 | 18 | 0.000 | bdl | 0.010 | 74 | bdl |
| 9.0 | 1.02 | 0.003 | 17 | 0.001 | bdl | 0.005 | 86 | bdl |
| 8.9 | 1.01 | 0.006 | 17 | 0.000 | bdl | 0.015 | 81 | bdl |
| 9.0 | 1.05 | 0.004 | 17 | 0.001 | bdl | 0.006 | 80 | bdl |
| 9.1 | 1.10 | 0.005 | 16 | 0.000 | bdl | 0.006 | 86 | bdl |
| 8.8 | 1.01 | 0.005 | 16 | 0.001 | bdl | 0.008 | 79 | bdl |
| 8.6 | 0.95 | 0.004 | 14 | 0.001 | bdl | 0.007 | 71 | bdl |
| 8.4 | 0.90 | 0.002 | 14 | 0.001 | bdl | 0.007 | 67 | bdl |
| 8.1 | 0.87 | 0.004 | 16 | 0.000 | bdl | 0.008 | 72 | bdl |
| 8.5 | 1.05 | 0.003 | 16 | 0.002 | bdl | 0.007 | 85 | bdl |
| 25.1 | 0.33 | 0.010 | 8 | 0.001 | bdl | 0.013 | 380 | bdl |
| 71.2 | 0.65 | 0.008 | 17 | -0.001 | bdl | 0.013 | 619 | bdl |
| 77.2 | 0.67 | 0.009 | 19 | 0.000 | bdl | 0.010 | 679 | bdl |
| 75.7 | 0.63 | 0.006 | 19 | 0.000 | bdl | 0.014 | 639 | bdl |
| 67.7 | 0.57 | 0.008 | 19 | -0.001 | bdl | 0.010 | 622 | bdl |
| 61.6 | 0.51 | 0.006 | 19 | -0.001 | bdl | 0.009 | 561 | bdl |
| | | | | | | | | |
| 42.9 | 0.30 | 0.007 | 18 | 0.000 | bdl | 0.012 | 434 | bdl |
| 43.7 | 0.28 | 0.010 | 18 | 0.000 | bdl | 0.018 | 407 | bdl |
| 44.1 | 0.29 | 0.010 | 18 | 0.000 | bdl | 0.012 | 389 | bdl |
| 45.4 | 0.28 | 0.006 | 18 | -0.001 | bdl | 0.012 | 384 | bdl |
| 43.7 | 0.28 | 0.007 | 17 | 0.000 | bdl | 0.010 | 364 | bdl |
| 43.2 | 0.26 | 0.007 | 18 | 0.000 | bdl | 0.004 | 354 | bdl |
| 42.5 | 0.25 | 0.006 | 18 | 0.000 | bdl | 0.018 | 344 | bdl |
| 44.1 | 0.27 | 0.008 | 22 | 0.000 | bdl | 0.011 | 346 | bdl |
| 43.1 | 0.25 | 0.008 | 24 | 0.000 | bdl | 0.015 | 334 | bdl |
| 43.7 | 0.25 | 0.009 | 24 | 0.000 | bdl | 0.017 | 332 | bdl |
| 43.7 | 0.25 | 0.006 | 22 | 0.001 | bdl | 0.014 | 333 | bdl |
| 25.0 | 1.19 | 0.006 | 16 | 0.000 | bdl | 0.012 | 285 | bdl |
| 25.9 | 1.33 | 0.008 | 17 | 0.000 | bdl | 0.014 | 290 | bdl |
| 26.0 | 1.39 | 0.005 | 17 | 0.000 | bdl | 0.018 | 292 | bdl |
| 43.2 | 0.23 | 0.007 | 19 | 0.001 | bdl | 0.010 | 277 | bdl |
| 44.4 | 0.24 | 0.008 | 19 | 0.021 | bdl | 0.010 | 284 | bdl |
| 42.8 | 0.22 | 0.008 | 19 | 0.000 | bdl | 0.009 | 261 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.055 | 1.1 | 0.153 | bdl | bdl | 0.008 | 12.9 |
| 0.028 | 1.1 | 0.150 | bdl | bdl | 0.007 | 12.3 |
| 0.048 | 1.0 | 0.139 | bdl | bdl | 0.006 | 12.0 |
| 0.058 | 1.1 | 0.135 | bdl | bdl | 0.006 | 11.3 |
| 0.060 | 1.0 | 0.133 | bdl | bdl | 0.004 | 12.1 |
| 0.058 | 1.0 | 0.125 | bdl | bdl | 0.004 | 10.0 |
| 0.023 | 1.0 | 0.118 | bdl | bdl | 0.004 | 10.7 |
| 0.041 | 0.9 | 0.108 | bdl | bdl | 0.006 | 9.2 |
| 0.045 | 0.9 | 0.097 | bdl | bdl | 0.002 | 7.9 |
| 0.005 | 1.6 | 0.091 | bdl | bdl | 0.003 | 8.4 |
| 0.052 | 1.0 | 0.083 | bdl | bdl | bdl | 7.5 |
| 0.035 | 0.8 | 0.076 | bdl | bdl | bdl | 7.6 |
| 0.011 | 0.8 | 0.067 | bdl | bdl | bdl | 5.6 |
| 0.030 | 0.9 | 0.066 | bdl | bdl | 0.002 | 5.4 |
| 0.037 | 0.9 | 0.061 | bdl | bdl | 0.003 | 5.9 |
| 0.009 | 0.7 | 0.057 | bdl | bdl | 0.002 | 5.0 |
| 0.025 | 0.7 | 0.056 | bdl | bdl | 0.002 | 5.0 |
| 0.010 | 0.8 | 0.055 | bdl | bdl | 0.000 | 5.2 |
| 0.029 | 0.8 | 0.060 | bdl | bdl | 0.001 | 3.2 |
| 0.023 | 0.9 | 0.069 | bdl | bdl | 0.002 | 3.2 |
| 0.017 | 0.9 | 0.072 | bdl | bdl | 0.002 | 4.3 |
| 0.032 | 0.9 | 0.072 | bdl | bdl | bdl | 4.5 |
| 0.031 | 0.9 | 0.071 | bdl | bdl | 0.004 | 4.5 |
| 0.002 | 0.9 | 0.072 | bdl | bdl | 0.007 | 5.4 |
| 0.025 | 0.8 | 0.067 | bdl | bdl | 0.002 | 5.8 |
| 0.016 | 0.8 | 0.066 | bdl | bdl | 0.003 | 7.5 |
| 0.011 | 0.7 | 0.066 | bdl | bdl | bdl | 8.3 |
| 0.027 | 0.7 | 0.062 | bdl | bdl | 0.001 | 5.5 |
| 0.024 | 0.8 | 0.061 | bdl | bdl | 0.002 | 5.5 |
| 0.073 | 2.9 | 0.388 | bdl | bdl | 0.002 | 0.0 |
| 0.113 | 6.4 | 0.569 | bdl | bdl | 0.007 | 0.0 |
| 0.108 | 6.4 | 0.568 | bdl | bdl | 0.008 | 0.0 |
| 0.101 | 5.9 | 0.551 | bdl | bdl | 0.007 | 0.0 |
| 0.119 | 5.3 | 0.528 | bdl | bdl | 0.009 | 0.0 |
| 0.099 | 5.3 | 0.516 | bdl | bdl | 0.006 | 0.0 |
| 0.106 | 3.1 | 0.370 | bdl | bdl | 0.011 | 0.0 |
| 0.120 | 3.3 | 0.339 | bdl | bdl | 0.010 | 0.1 |
| 0.105 | 3.2 | 0.318 | bdl | bdl | 0.007 | 0.0 |
| 0.115 | 3.1 | 0.311 | bdl | bdl | 0.011 | 0.0 |
| 0.117 | 2.9 | 0.296 | bdl | bdl | 0.007 | 0.0 |
| 0.092 | 2.8 | 0.293 | bdl | bdl | 0.004 | 0.0 |
| 0.087 | 2.7 | 0.287 | bdl | bdl | 0.002 | 0.0 |
| 0.094 | 2.8 | 0.298 | bdl | bdl | 0.005 | 0.1 |
| 0.100 | 2.7 | 0.282 | bdl | bdl | 0.006 | 0.0 |
| 0.092 | 2.6 | 0.280 | bdl | bdl | 0.007 | 0.0 |
| 0.107 | 2.4 | 0.279 | bdl | bdl | 0.003 | 0.1 |
| 0.096 | 1.8 | 0.218 | bdl | bdl | 0.002 | 8.7 |
| 0.071 | 1.8 | 0.230 | bdl | bdl | 0.002 | 8.3 |
| 0.048 | 1.7 | 0.229 | bdl | bdl | 0.001 | 8.4 |
| 0.046 | 2.1 | 0.223 | bdl | bdl | 0.010 | 0.0 |
| 0.063 | 2.1 | 0.226 | bdl | bdl | 0.010 | 0.0 |
| 0.045 | 2.2 | 0.207 | bdl | bdl | 0.012 | 0.0 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Pyrite mixed culture | 25 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 26 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 27 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 28 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 29 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 30 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 31 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 32 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 33 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 34 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 35 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 36 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 37 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 38 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 39 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 40 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 41 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 42 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 43 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 44 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 45 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 46 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 47 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 48 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 49 | bdl | bdl | bdl | bdl | 0.06 |
| Talbot/T7 Pyrite mixed culture | 50 | bdl | bdl | bdl | bdl | 0.08 |
| Talbot/T7 Pyrite mixed culture | 53 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 54 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 55 | bdl | bdl | bdl | bdl | 0.08 |
| Talbot/T7 Pyrite mixed culture | 56 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Pyrite mixed culture | 57 | bdl | bdl | bdl | bdl | 0.07 |
| Talbot/T7 Ore Control | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 3 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 5 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 13 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 14 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 15 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 18 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 22 | bdl | bdl | bdl | bdl | bdl |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.05 | 282 | bdl | bdl | bdl | 0.024 | 0.02 | 15.9 | 0.03 |
| 0.06 | 275 | bdl | bdl | bdl | 0.022 | 0.02 | 15.7 | 0.03 |
| 0.06 | 273 | bdl | bdl | bdl | 0.022 | 0.01 | 15.6 | 0.03 |
| 0.06 | 267 | bdl | bdl | bdl | 0.015 | 0.04 | 16.0 | 0.03 |
| 0.06 | 263 | bdl | bdl | bdl | 0.015 | 0.03 | 15.7 | 0.03 |
| 0.06 | 250 | bdl | bdl | bdl | 0.018 | 0.01 | 15.0 | 0.03 |
| 0.06 | 251 | bdl | bdl | bdl | 0.013 | 0.01 | 15.2 | 0.03 |
| 0.06 | 242 | bdl | bdl | bdl | 0.014 | 0.02 | 15.3 | 0.02 |
| 0.06 | 234 | bdl | bdl | bdl | 0.015 | 0.10 | 15.4 | 0.03 |
| 0.07 | 238 | bdl | bdl | bdl | 0.013 | 0.21 | 15.3 | 0.02 |
| 0.07 | 232 | bdl | bdl | bdl | 0.014 | 0.01 | 15.6 | 0.02 |
| 0.07 | 219 | bdl | bdl | bdl | 0.015 | 0.03 | 15.0 | 0.02 |
| 0.07 | 218 | bdl | bdl | bdl | 0.010 | 0.05 | 14.8 | 0.02 |
| 0.07 | 209 | bdl | bdl | bdl | 0.011 | 0.02 | 14.7 | 0.02 |
| 0.07 | 203 | bdl | bdl | bdl | 0.013 | 0.01 | 14.4 | 0.02 |
| 0.08 | 200 | bdl | bdl | bdl | 0.010 | 0.01 | 14.6 | 0.02 |
| 0.07 | 192 | bdl | bdl | bdl | 0.010 | 0.01 | 14.6 | 0.01 |
| 0.07 | 183 | bdl | bdl | bdl | 0.010 | 0.01 | 14.6 | 0.01 |
| 0.07 | 177 | bdl | bdl | bdl | 0.014 | 0.05 | 14.5 | 0.01 |
| 0.07 | 153 | bdl | bdl | bdl | 0.014 | 0.02 | 14.3 | 0.01 |
| 0.07 | 146 | bdl | bdl | bdl | 0.010 | 0.01 | 14.2 | 0.01 |
| 0.07 | 136 | bdl | bdl | bdl | 0.012 | 0.02 | 14.4 | 0.01 |
| 0.07 | 111 | bdl | bdl | bdl | 0.012 | 0.01 | 14.8 | 0.01 |
| 0.07 | 81 | bdl | bdl | bdl | 0.014 | 0.03 | 14.3 | 0.01 |
| 0.06 | 73 | bdl | bdl | bdl | 0.013 | 0.01 | 13.9 | 0.01 |
| 0.07 | 99 | bdl | bdl | bdl | 0.020 | 0.05 | 15.8 | 0.02 |
| 0.06 | 64 | bdl | bdl | bdl | 0.013 | 0.01 | 14.2 | 0.01 |
| 0.06 | 59 | bdl | bdl | bdl | 0.014 | 0.01 | 13.8 | 0.01 |
| 0.06 | 59 | bdl | bdl | bdl | 0.014 | 0.01 | 14.5 | 0.01 |
| 0.06 | 55 | bdl | bdl | bdl | 0.010 | 0.00 | 13.7 | 0.01 |
| 0.06 | 53 | bdl | bdl | bdl | 0.010 | 0.00 | 13.3 | 0.01 |
| 0.13 | 570 | 0.03 | bdl | bdl | bdl | 120.86 | Sat | 0.04 |
| 0.11 | 594 | 0.02 | bdl | bdl | 0.006 | 113.20 | Sat | 0.04 |
| 0.06 | 559 | bdl | bdl | bdl | 0.090 | 75.34 | 55 | 0.06 |
| 0.05 | 570 | bdl | bdl | bdl | 0.090 | 61.10 | 49 | 0.05 |
| 0.05 | 583 | bdl | bdl | bdl | 0.091 | 51.94 | 46 | 0.05 |
| 0.05 | 601 | bdl | bdl | bdl | 0.092 | 45.71 | 45 | 0.05 |
| 0.05 | 590 | bdl | bdl | bdl | 0.093 | 39.96 | 42 | 0.04 |
| 0.05 | 590 | bdl | bdl | bdl | 0.093 | 35.43 | 38 | 0.04 |
| 0.05 | 580 | bdl | bdl | bdl | 0.093 | 33.73 | 35 | 0.04 |
| 0.04 | 568 | bdl | bdl | bdl | 0.091 | 30.10 | 32 | 0.03 |
| 0.05 | 587 | bdl | bdl | bdl | 0.093 | 27.83 | 34 | 0.03 |
| 0.05 | 589 | bdl | bdl | bdl | 0.093 | 24.90 | 32 | 0.03 |
| 0.04 | 591 | bdl | bdl | bdl | 0.094 | 22.47 | 31 | 0.03 |
| 0.07 | 606 | bdl | bdl | bdl | 0.005 | 18.74 | Sat | 0.01 |
| 0.07 | 566 | bdl | bdl | bdl | 0.003 | 17.22 | Sat | 0.01 |
| 0.06 | 559 | bdl | bdl | bdl | bdl | 15.14 | Sat | 0.01 |
| 0.06 | 552 | bdl | bdl | bdl | 0.000 | 13.33 | 55 | 0.01 |
| 0.10 | 612 | bdl | bdl | bdl | 0.003 | 13.14 | 77 | 0.03 |
| 0.09 | 617 | bdl | bdl | bdl | 0.002 | 11.68 | 70 | 0.03 |
| 0.09 | 620 | bdl | bdl | bdl | 0.003 | 10.57 | 68 | 0.03 |
| 0.09 | 615 | bdl | bdl | bdl | 0.002 | 9.63 | 64 | 0.02 |
| 0.09 | 628 | bdl | bdl | bdl | 0.002 | 8.91 | 64 | 0.02 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 42.4 | 0.23 | 0.006 | 19 | 0.000 | bdl | 0.010 | 261 | bdl |
| 42.2 | 0.22 | 0.008 | 19 | bdl | bdl | 0.004 | 260 | bdl |
| 42.0 | 0.22 | 0.005 | 19 | 0.001 | bdl | 0.010 | 256 | bdl |
| 42.1 | 0.21 | 0.006 | 19 | 0.001 | bdl | 0.014 | 260 | bdl |
| 42.1 | 0.20 | 0.007 | 19 | 0.001 | bdl | 0.013 | 251 | bdl |
| 41.8 | 0.19 | 0.005 | 19 | 0.001 | bdl | 0.009 | 238 | bdl |
| 41.5 | 0.19 | 0.007 | 19 | 0.001 | bdl | 0.015 | 239 | bdl |
| 40.5 | 0.18 | 0.008 | 20 | 0.000 | bdl | 0.009 | 227 | bdl |
| 41.1 | 0.18 | 0.007 | 21 | 0.001 | bdl | 0.010 | 222 | bdl |
| 39.7 | 0.18 | 0.006 | 21 | 0.001 | bdl | 0.007 | 221 | bdl |
| 40.6 | 0.18 | 0.007 | 22 | 0.001 | bdl | 0.013 | 218 | bdl |
| 39.8 | 0.18 | 0.006 | 21 | 0.000 | bdl | 0.009 | 210 | bdl |
| 38.2 | 0.17 | 0.008 | 21 | 0.001 | bdl | 0.007 | 204 | bdl |
| 37.6 | 0.17 | 0.007 | 21 | 0.001 | bdl | 0.010 | 197 | bdl |
| 37.8 | 0.17 | 0.006 | 21 | 0.001 | bdl | 0.006 | 190 | bdl |
| 38.3 | 0.16 | 0.007 | 21 | 0.002 | bdl | 0.009 | 189 | bdl |
| 38.1 | 0.15 | 0.005 | 21 | bdl | bdl | 0.006 | 185 | bdl |
| 38.3 | 0.15 | 0.004 | 21 | bdl | bdl | 0.005 | 177 | bdl |
| 37.9 | 0.15 | 0.006 | 21 | 0.001 | bdl | 0.012 | 173 | bdl |
| 36.8 | 0.14 | 0.004 | 21 | bdl | bdl | 0.005 | 151 | bdl |
| 41.0 | 0.13 | 0.006 | 21 | 0.001 | bdl | 0.009 | 157 | bdl |
| 44.2 | 0.13 | 0.005 | 21 | 0.001 | bdl | 0.003 | 151 | bdl |
| 45.5 | 0.13 | 0.005 | 21 | 0.001 | bdl | 0.004 | 136 | bdl |
| 45.4 | 0.12 | 0.004 | 21 | 0.000 | bdl | 0.009 | 110 | bdl |
| 45.9 | 0.12 | 0.003 | 20 | 0.001 | bdl | 0.002 | 104 | bdl |
| 65.6 | 0.16 | 0.004 | 22 | 0.000 | bdl | 0.006 | 159 | bdl |
| 47.0 | 0.11 | 0.005 | 20 | 0.003 | bdl | 0.007 | 99 | bdl |
| 45.6 | 0.11 | 0.002 | 21 | bdl | bdl | 0.000 | 94 | bdl |
| 47.3 | 0.11 | 0.003 | 22 | bdl | bdl | 0.007 | 99 | bdl |
| 44.2 | 0.10 | 0.002 | 21 | 0.001 | bdl | 0.007 | 92 | bdl |
| 44.3 | 0.10 | 0.004 | 21 | 0.001 | bdl | bdl | 90 | bdl |
| 84.1 | 23.3 | bdl | Sat | bdl | bdl | bdl | 351 | bdl |
| 82.2 | 21.9 | bdl | Sat | bdl | bdl | bdl | 350 | bdl |
| 64.4 | 17.9 | bdl | 26.4 | bdl | bdl | bdl | 686 | bdl |
| 58.2 | 15.9 | bdl | 26.3 | bdl | bdl | bdl | 684 | bdl |
| 55.4 | 14.9 | bdl | 21.4 | bdl | bdl | bdl | 681 | bdl |
| 53.9 | 14.5 | bdl | 20.7 | bdl | bdl | bdl | 688 | bdl |
| 50.2 | 13.6 | bdl | 19.6 | bdl | bdl | bdl | 673 | bdl |
| 45.8 | 12.4 | bdl | 19.9 | bdl | bdl | bdl | 684 | bdl |
| 46.6 | 12.9 | bdl | 18.6 | bdl | bdl | bdl | 672 | bdl |
| 44.6 | 12.4 | bdl | 17.3 | bdl | bdl | bdl | 658 | bdl |
| 44.6 | 12.3 | bdl | 19.4 | bdl | bdl | bdl | 675 | bdl |
| 42.5 | 11.6 | bdl | 18.4 | bdl | bdl | bdl | 676 | bdl |
| 40.8 | 11.1 | bdl | 18.3 | bdl | bdl | bdl | 672 | bdl |
| 39.7 | 9.7 | bdl | Sat | bdl | bdl | bdl | 289 | bdl |
| 39.6 | 9.5 | bdl | Sat | bdl | bdl | bdl | 274 | bdl |
| 37.3 | 8.9 | bdl | Sat | bdl | bdl | bdl | 268 | bdl |
| 35.8 | 8.4 | bdl | 33 | bdl | bdl | bdl | 266 | bdl |
| 36.8 | 8.9 | bdl | 19.2 | bdl | bdl | bdl | 620 | bdl |
| 36.1 | 8.5 | bdl | 17.9 | bdl | bdl | bdl | 615 | bdl |
| 34.5 | 8.2 | bdl | 17.5 | bdl | bdl | bdl | 614 | bdl |
| 33.1 | 7.8 | bdl | 16.8 | bdl | bdl | bdl | 605 | bdl |
| 32.0 | 7.6 | bdl | 17.4 | bdl | bdl | bdl | 617 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.065 | 1.8 | 0.211 | bdl | bdl | 0.012 | 0.03 |
| 0.069 | 1.9 | 0.207 | bdl | bdl | 0.011 | 0.02 |
| 0.056 | 1.8 | 0.205 | bdl | bdl | 0.012 | 0.02 |
| 0.078 | 1.9 | 0.202 | bdl | bdl | 0.012 | 0.03 |
| 0.077 | 1.9 | 0.198 | bdl | bdl | 0.014 | 0.01 |
| 0.066 | 1.8 | 0.191 | bdl | bdl | 0.011 | 0.02 |
| 0.062 | 1.9 | 0.191 | bdl | bdl | 0.012 | 0.02 |
| 0.051 | 1.8 | 0.190 | bdl | bdl | 0.010 | 0.02 |
| 0.070 | 2.0 | 0.182 | bdl | bdl | 0.009 | 0.02 |
| 0.063 | 1.8 | 0.185 | bdl | bdl | 0.009 | 0.02 |
| 0.080 | 1.9 | 0.182 | bdl | bdl | 0.009 | 0.02 |
| 0.075 | 1.9 | 0.170 | bdl | bdl | 0.011 | 0.01 |
| 0.089 | 1.8 | 0.169 | bdl | bdl | 0.005 | 0.02 |
| 0.053 | 1.7 | 0.163 | bdl | bdl | 0.006 | 0.02 |
| 0.061 | 1.6 | 0.159 | bdl | bdl | 0.006 | 0.03 |
| 0.062 | 1.7 | 0.156 | bdl | bdl | 0.004 | 0.03 |
| 0.068 | 1.7 | 0.150 | bdl | bdl | 0.006 | 0.01 |
| 0.048 | 1.6 | 0.142 | bdl | bdl | 0.005 | 0.01 |
| 0.056 | 1.7 | 0.137 | bdl | bdl | 0.006 | 0.02 |
| 0.053 | 1.6 | 0.121 | bdl | bdl | 0.008 | 0.10 |
| 0.048 | 1.8 | 0.113 | bdl | bdl | 0.008 | 0.01 |
| 0.059 | 1.6 | 0.107 | bdl | bdl | 0.010 | 0.02 |
| 0.043 | 1.5 | 0.090 | bdl | bdl | 0.008 | 0.03 |
| 0.033 | 1.4 | 0.070 | bdl | bdl | 0.008 | 0.01 |
| 0.057 | 1.4 | 0.065 | bdl | bdl | 0.010 | 0.01 |
| 0.064 | 1.5 | 0.085 | bdl | bdl | 0.013 | 0.02 |
| 0.036 | 1.3 | 0.058 | bdl | bdl | 0.010 | 0.84 |
| 0.034 | 1.2 | 0.055 | bdl | bdl | 0.008 | 0.04 |
| 0.037 | 1.2 | 0.056 | bdl | bdl | 0.006 | 0.06 |
| 0.025 | 1.2 | 0.052 | bdl | bdl | 0.007 | 0.04 |
| 0.034 | 1.2 | 0.048 | bdl | bdl | 0.008 | 0.03 |
| 0.17 | 4.9 | 1.15 | bdl | bdl | bdl | 79.30 |
| 0.15 | 5.3 | 1.27 | bdl | bdl | bdl | 70.17 |
| 0.15 | 9.2 | 0.89 | bdl | bdl | bdl | 42.36 |
| 0.13 | 9.1 | 0.85 | bdl | bdl | bdl | 35.10 |
| 0.14 | 9.1 | 0.82 | bdl | bdl | bdl | 30.91 |
| 0.13 | 9.3 | 0.78 | bdl | bdl | bdl | 28.77 |
| 0.13 | 9.3 | 0.73 | bdl | bdl | bdl | 26.50 |
| 0.12 | 8.6 | 0.63 | bdl | bdl | bdl | 25.71 |
| 0.10 | 8.5 | 0.61 | bdl | bdl | bdl | 26.86 |
| 0.12 | 8.4 | 0.57 | bdl | bdl | bdl | 25.56 |
| 0.10 | 8.6 | 0.58 | bdl | bdl | bdl | 25.00 |
| 0.12 | 8.5 | 0.56 | bdl | bdl | bdl | 23.21 |
| 0.12 | 8.3 | 0.56 | bdl | bdl | bdl | 21.62 |
| 0.11 | 4.0 | 0.63 | bdl | bdl | bdl | 16.73 |
| 0.08 | 3.8 | 0.61 | bdl | bdl | bdl | 17.72 |
| 0.09 | 3.7 | 0.59 | bdl | bdl | bdl | 15.84 |
| 0.07 | 3.6 | 0.57 | bdl | bdl | bdl | 14.56 |
| 0.23 | 4.0 | 0.86 | bdl | bdl | bdl | 16.39 |
| 0.14 | 4.1 | 0.83 | bdl | bdl | bdl | 14.97 |
| 0.21 | 4.0 | 0.83 | bdl | bdl | bdl | 13.98 |
| 0.19 | 3.9 | 0.78 | bdl | bdl | bdl | 13.04 |
| 0.18 | 3.9 | 0.81 | bdl | bdl | bdl | 12.59 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Ore Control | 23 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 24 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 27 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Control | 29 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 30 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 31 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 32 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 33 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 34 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 35 | bdl | bdl | bdl | bdl | 0.02 |
| Talbot/T7 Ore Control | 36 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Control | 37 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Control | 38 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Control | 39 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Control | 40 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 41 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Control | 41 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 43 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 44 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 45 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 46 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 47 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 48 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Control | 49 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Isolate | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 3 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 5 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 13 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 14 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 15 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 18 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 22 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 24 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 27 | bdl | bdl | bdl | bdl | bdl |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.09 | 621 | bdl | bdl | bdl | 0.003 | 8.10 | 57 | 0.02 |
| 0.08 | 553 | bdl | bdl | bdl | 0.002 | 6.50 | 48 | 0.02 |
| 0.09 | 623 | bdl | bdl | bdl | 0.003 | 6.36 | 53 | 0.02 |
| 0.08 | 624 | bdl | bdl | bdl | 0.003 | 5.97 | 51 | 0.02 |
| 0.08 | 615 | bdl | bdl | bdl | 0.003 | 5.36 | 49 | 0.02 |
| 0.09 | 616 | bdl | bdl | bdl | 0.003 | 4.35 | 48 | 0.02 |
| bdl | 539 | bdl | bdl | bdl | 0.001 | 3.46 | 26 | bdl |
| bdl | 533 | bdl | bdl | bdl | 0.001 | 3.29 | 25 | bdl |
| bdl | 524 | bdl | bdl | bdl | 0.001 | 2.77 | 24 | bdl |
| bdl | 533 | bdl | bdl | bdl | 0.001 | 2.55 | 23 | bdl |
| bdl | 540 | bdl | bdl | bdl | 0.001 | 3.51 | 26 | bdl |
| bdl | 550 | bdl | bdl | bdl | 0.001 | 2.84 | 25 | bdl |
| bdl | 574 | bdl | bdl | bdl | 0.001 | bdl | 25 | bdl |
| bdl | 548 | bdl | bdl | bdl | 0.001 | 1.96 | 22 | bdl |
| bdl | 586 | bdl | bdl | bdl | 0.000 | 1.64 | 26 | bdl |
| bdl | 584 | bdl | bdl | bdl | 0.001 | 1.47 | 25 | bdl |
| bdl | 562 | bdl | bdl | bdl | 0.000 | 1.25 | 24 | bdl |
| bdl | 447 | bdl | bdl | bdl | bdl | 0.04 | 18 | bdl |
| bdl | 464 | bdl | bdl | bdl | 0.001 | 0.03 | 19 | bdl |
| bdl | 378 | bdl | bdl | bdl | bdl | 0.01 | 15 | bdl |
| bdl | 387 | bdl | bdl | bdl | bdl | 0.10 | 15 | bdl |
| bdl | 367 | bdl | bdl | bdl | bdl | 0.09 | 15 | bdl |
| bdl | 352 | bdl | bdl | bdl | bdl | 0.06 | 19 | bdl |
| bdl | 391 | bdl | bdl | bdl | bdl | 0.07 | 24 | bdl |
| bdl | 367 | bdl | bdl | bdl | bdl | 0.01 | 18 | bdl |
| bdl | 344 | bdl | bdl | bdl | bdl | 0.04 | 15 | bdl |
| bdl | 325 | bdl | bdl | bdl | bdl | 0.03 | 13 | bdl |
| 0.14 | 598 | 0.01 | bdl | bdl | 0.002 | 56.21 | Sat | 0.02 |
| 0.14 | 599 | 0.01 | bdl | bdl | 0.089 | 42.06 | Sat | 0.02 |
| 0.07 | 563 | bdl | bdl | bdl | 0.319 | 42.19 | 47 | 0.04 |
| 0.07 | 574 | bdl | bdl | bdl | 0.092 | 33.77 | 44 | 0.04 |
| 0.07 | 589 | bdl | bdl | bdl | 0.094 | 28.71 | 44 | 0.04 |
| 0.07 | 593 | bdl | bdl | bdl | 0.094 | 24.72 | 41 | 0.04 |
| 0.06 | 595 | bdl | bdl | bdl | 0.093 | 21.16 | 39 | 0.04 |
| 0.06 | 555 | bdl | bdl | bdl | 0.102 | 12.23 | 30 | 0.02 |
| 0.06 | 584 | bdl | bdl | bdl | 0.097 | 17.19 | 33 | 0.03 |
| 0.06 | 568 | bdl | bdl | bdl | 0.093 | 15.86 | 31 | 0.03 |
| 0.06 | 581 | bdl | bdl | bdl | 0.093 | 7.23 | 25 | 0.02 |
| 0.06 | 586 | bdl | bdl | bdl | 0.093 | 9.85 | 28 | 0.02 |
| 0.06 | 584 | bdl | bdl | bdl | 0.095 | 9.97 | 28 | 0.03 |
| 0.09 | 594 | bdl | bdl | bdl | 0.005 | 7.41 | 61 | 0.01 |
| 0.08 | 574 | bdl | bdl | bdl | 0.004 | 5.75 | 54 | 0.01 |
| 0.08 | 538 | bdl | bdl | bdl | bdl | 5.51 | 52 | 0.01 |
| 0.08 | 541 | bdl | bdl | bdl | bdl | 4.61 | 50 | 0.01 |
| 0.12 | 609 | bdl | bdl | bdl | 0.002 | 4.76 | 71 | 0.02 |
| 0.12 | 605 | bdl | bdl | bdl | 0.003 | 3.63 | 60 | 0.02 |
| 0.12 | 603 | bdl | bdl | bdl | 0.002 | 2.98 | 60 | 0.02 |
| 0.11 | 597 | bdl | bdl | bdl | 0.002 | 2.78 | 53 | 0.02 |
| 0.11 | 613 | bdl | bdl | bdl | 0.003 | 2.83 | 59 | 0.02 |
| 0.11 | 609 | bdl | bdl | bdl | 0.003 | 2.44 | 54 | 0.01 |
| 0.10 | 600 | bdl | bdl | bdl | 0.001 | 2.36 | 48 | 0.01 |
| 0.11 | 595 | bdl | bdl | bdl | 0.002 | 2.20 | 48 | 0.01 |
| 0.11 | 594 | bdl | bdl | bdl | 0.003 | 2.20 | 47 | 0.01 |
| 0.10 | 580 | bdl | bdl | bdl | 0.003 | 1.98 | 45 | 0.01 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 31.8 | 7.4 | bdl | 15.7 | bdl | bdl | bdl | 605 | bdl |
| 28.2 | 6.3 | bdl | 12.9 | bdl | bdl | bdl | 539 | bdl |
| 29.3 | 6.7 | bdl | 14.9 | bdl | bdl | bdl | 605 | bdl |
| 27.3 | 6.6 | bdl | 14.9 | bdl | bdl | bdl | 607 | bdl |
| 25.8 | 6.2 | bdl | 14.4 | bdl | bdl | bdl | 593 | bdl |
| 25.9 | 5.7 | bdl | 14.3 | bdl | bdl | bdl | 597 | bdl |
| 24.6 | 4.9 | bdl | 64.4 | bdl | bdl | bdl | 431 | bdl |
| 24.7 | 4.8 | bdl | Sat | bdl | 0.000 | bdl | 438 | bdl |
| 23.2 | 4.5 | bdl | 62.1 | bdl | bdl | bdl | 427 | bdl |
| 23.0 | 4.5 | bdl | 63.0 | bdl | bdl | bdl | 432 | bdl |
| 28.9 | 6.7 | bdl | 64.4 | bdl | 0.002 | bdl | 440 | bdl |
| 25.8 | 6.2 | bdl | 63.4 | bdl | 0.008 | bdl | 442 | bdl |
| 24.4 | 5.7 | bdl | 66.0 | bdl | bdl | bdl | 470 | bdl |
| 21.6 | 5.1 | bdl | Sat | bdl | 0.011 | bdl | 443 | bdl |
| 21.3 | 5.0 | bdl | Sat | bdl | 0.017 | bdl | 454 | bdl |
| 20.1 | 4.6 | bdl | Sat | bdl | 0.020 | bdl | 456 | bdl |
| 18.5 | 4.2 | bdl | 65.2 | bdl | 0.022 | bdl | 439 | bdl |
| 12.8 | 1.4 | bdl | Sat | bdl | 0.006 | bdl | 348 | bdl |
| 13.5 | 1.3 | bdl | Sat | bdl | 0.007 | bdl | 362 | bdl |
| 11.0 | 1.0 | bdl | 54.4 | bdl | 0.005 | bdl | 293 | bdl |
| 11.1 | 0.9 | bdl | 55.7 | bdl | 0.004 | bdl | 295 | bdl |
| 10.8 | 0.8 | bdl | 59.2 | bdl | bdl | bdl | 280 | bdl |
| 11.8 | 0.7 | bdl | Sat | bdl | bdl | bdl | 269 | bdl |
| 13.8 | 0.8 | bdl | Sat | bdl | 0.004 | bdl | 295 | bdl |
| 11.5 | 0.7 | bdl | Sat | bdl | 0.007 | bdl | 285 | bdl |
| 10.1 | 0.6 | bdl | Sat | bdl | 0.004 | bdl | 263 | bdl |
| 9.5 | 0.5 | bdl | Sat | bdl | 0.001 | bdl | 253 | bdl |
| 52.4 | 14.8 | bdl | Sat | bdl | bdl | bdl | 322 | bdl |
| 48.8 | 12.7 | bdl | Sat | bdl | bdl | bdl | 308 | bdl |
| 50.8 | 14.1 | bdl | 53.5 | bdl | bdl | bdl | 669 | bdl |
| 50.0 | 13.7 | bdl | 49.2 | bdl | bdl | bdl | 672 | bdl |
| 46.5 | 12.5 | bdl | 46.4 | bdl | bdl | bdl | 682 | bdl |
| 43.3 | 11.8 | bdl | 43.5 | bdl | bdl | bdl | 683 | bdl |
| 40.7 | 10.8 | bdl | 41.5 | bdl | bdl | bdl | 670 | bdl |
| 27.1 | 6.4 | bdl | 30.1 | bdl | bdl | bdl | 676 | bdl |
| 35.7 | 9.3 | bdl | 36.3 | bdl | bdl | bdl | 660 | bdl |
| 34.3 | 9.0 | bdl | 33.8 | bdl | bdl | bdl | 652 | bdl |
| 22.6 | 5.2 | bdl | 24.5 | bdl | bdl | bdl | 644 | bdl |
| 28.0 | 6.9 | bdl | 29.2 | bdl | bdl | bdl | 656 | bdl |
| 29.0 | 7.1 | bdl | 30.5 | bdl | bdl | bdl | 656 | bdl |
| 27.5 | 5.9 | bdl | Sat | bdl | bdl | bdl | 278 | bdl |
| 23.9 | 5.0 | bdl | Sat | bdl | bdl | bdl | 265 | bdl |
| 23.6 | 5.0 | bdl | Sat | bdl | bdl | bdl | 253 | bdl |
| 22.2 | 4.5 | bdl | Sat | bdl | bdl | bdl | 253 | bdl |
| 23.6 | 4.9 | bdl | 26.1 | bdl | bdl | bdl | 600 | bdl |
| 21.6 | 4.2 | bdl | 22.2 | bdl | bdl | bdl | 593 | bdl |
| 20.1 | 3.7 | bdl | 22.4 | bdl | bdl | bdl | 583 | bdl |
| 19.0 | 3.5 | bdl | 19.9 | bdl | bdl | bdl | 585 | bdl |
| 19.0 | 3.6 | bdl | 21.8 | bdl | bdl | bdl | 594 | bdl |
| 18.3 | 3.3 | bdl | 19.9 | bdl | bdl | bdl | 585 | bdl |
| 17.9 | 3.3 | bdl | 18.1 | bdl | bdl | bdl | 573 | bdl |
| 18.0 | 3.2 | bdl | 18.1 | bdl | bdl | bdl | 559 | bdl |
| 17.6 | 3.3 | bdl | 18.1 | bdl | bdl | bdl | 573 | bdl |
| 16.5 | 3.1 | bdl | 17.1 | bdl | bdl | bdl | 547 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.14 | 3.9 | 0.76 | bdl | bdl | bdl | 11.84 |
| 0.17 | 3.6 | 0.68 | bdl | bdl | bdl | 9.85 |
| 0.14 | 3.9 | 0.74 | bdl | bdl | bdl | 9.93 |
| 0.23 | 3.8 | 0.71 | bdl | bdl | bdl | 9.66 |
| 0.17 | 3.6 | 0.69 | bdl | bdl | bdl | 8.87 |
| 0.15 | 3.8 | 0.73 | bdl | bdl | bdl | 7.86 |
| 0.06 | 3.4 | 0.45 | bdl | bdl | 0.002 | 6.55 |
| 0.06 | 3.8 | 0.45 | bdl | bdl | 0.003 | 6.51 |
| 0.06 | 3.7 | 0.43 | bdl | bdl | 0.002 | 5.73 |
| 0.05 | 3.8 | 0.43 | bdl | bdl | 0.002 | 5.66 |
| 0.06 | 3.8 | 0.47 | bdl | bdl | 0.003 | 10.99 |
| 0.05 | 3.7 | 0.46 | bdl | bdl | 0.004 | 10.54 |
| 0.05 | 3.6 | 0.46 | bdl | bdl | 0.001 | 2.15 |
| 0.05 | 3.6 | 0.44 | bdl | bdl | 0.004 | 8.96 |
| 0.04 | 3.9 | 0.45 | bdl | bdl | 0.005 | 8.91 |
| 0.04 | 3.9 | 0.44 | bdl | bdl | 0.008 | 8.29 |
| 0.03 | 3.7 | 0.42 | bdl | bdl | 0.005 | 7.71 |
| 0.02 | 3.0 | 0.29 | bdl | bdl | 0.004 | 1.91 |
| 0.02 | 3.2 | 0.30 | bdl | bdl | 0.008 | 1.77 |
| 0.02 | 2.5 | 0.23 | bdl | bdl | bdl | 1.25 |
| 0.02 | 2.6 | 0.23 | bdl | bdl | 0.000 | 1.12 |
| 0.02 | 2.4 | 0.22 | bdl | bdl | bdl | 0.96 |
| 0.03 | 2.4 | 0.22 | bdl | bdl | 0.000 | 0.85 |
| 0.03 | 2.7 | 0.24 | bdl | bdl | 0.006 | 0.87 |
| 0.02 | 2.6 | 0.22 | bdl | bdl | 0.005 | 0.73 |
| 0.02 | 2.4 | 0.19 | bdl | bdl | 0.003 | 0.62 |
| 0.01 | 2.2 | 0.19 | bdl | bdl | 0.003 | 0.50 |
| 0.12 | 4.0 | 1.03 | bdl | bdl | bdl | 54.51 |
| 0.13 | 4.0 | 0.97 | bdl | bdl | bdl | 39.28 |
| 0.14 | 7.8 | 0.74 | bdl | bdl | bdl | 42.93 |
| 0.14 | 7.7 | 0.74 | bdl | bdl | bdl | 38.91 |
| 0.11 | 7.6 | 0.72 | bdl | bdl | bdl | 33.71 |
| 0.12 | 7.6 | 0.70 | bdl | bdl | bdl | 30.03 |
| 0.11 | 7.6 | 0.66 | bdl | bdl | bdl | 25.56 |
| 0.10 | 6.9 | 0.49 | bdl | bdl | bdl | 14.36 |
| 0.11 | 7.1 | 0.58 | bdl | bdl | bdl | 23.02 |
| 0.13 | 7.0 | 0.56 | bdl | bdl | bdl | 21.87 |
| 0.11 | 6.3 | 0.47 | bdl | bdl | bdl | 8.99 |
| 0.10 | 6.8 | 0.50 | bdl | bdl | bdl | 13.67 |
| 0.10 | 6.8 | 0.52 | bdl | bdl | bdl | 14.35 |
| 0.09 | 3.4 | 0.60 | bdl | bdl | bdl | 7.85 |
| 0.09 | 3.1 | 0.55 | bdl | bdl | bdl | 6.09 |
| 0.09 | 3.0 | 0.53 | bdl | bdl | bdl | 5.98 |
| 0.08 | 3.0 | 0.51 | bdl | bdl | bdl | 5.23 |
| 0.17 | 3.4 | 0.78 | bdl | bdl | bdl | 6.07 |
| 0.17 | 3.4 | 0.73 | bdl | bdl | bdl | 4.79 |
| 0.15 | 3.3 | 0.74 | bdl | bdl | bdl | 3.74 |
| 0.18 | 3.3 | 0.66 | bdl | bdl | bdl | 3.27 |
| 0.18 | 3.3 | 0.71 | bdl | bdl | bdl | 3.31 |
| 0.23 | 3.4 | 0.67 | bdl | bdl | bdl | 2.86 |
| 0.15 | 3.3 | 0.63 | bdl | bdl | bdl | 2.84 |
| 0.17 | 3.4 | 0.64 | bdl | bdl | bdl | 2.75 |
| 0.20 | 3.3 | 0.64 | bdl | bdl | bdl | 2.77 |
| 0.10 | 3.2 | 0.62 | bdl | bdl | bdl | 2.66 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Ore Isolate | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Isolate | 29 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 30 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 31 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 32 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 33 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 34 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 35 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 35 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 36 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 37 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 38 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 39 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 40 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 41 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 42 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Isolate | 43 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Isolate | 44 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Isolate | 46 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Isolate | 47 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Isolate | 48 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Isolate | 49 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 5 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 13 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 14 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 15 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 22 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 23 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 27 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 27 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 29 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore S-oxidizer | 30 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 32 | bdl | bdl | bdl | bdl | 0.00 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.10 | 578 | bdl | bdl | bdl | 0.003 | 1.79 | 45 | 0.01 |
| bdl | 493 | bdl | bdl | bdl | 0.001 | 1.47 | 24 | bdl |
| bdl | 478 | bdl | bdl | bdl | 0.000 | 1.35 | 23 | bdl |
| bdl | 451 | bdl | bdl | bdl | 0.001 | 1.09 | 22 | bdl |
| bdl | 447 | bdl | bdl | bdl | 0.000 | 1.19 | 23 | bdl |
| bdl | 438 | bdl | bdl | bdl | 0.001 | 1.06 | 22 | bdl |
| bdl | 430 | bdl | bdl | bdl | 0.000 | 0.89 | 21 | bdl |
| bdl | 461 | bdl | bdl | bdl | 0.000 | bdl | 23 | bdl |
| bdl | 454 | bdl | bdl | bdl | 0.002 | 0.83 | 22 | bdl |
| bdl | 443 | bdl | bdl | bdl | 0.000 | 0.71 | 24 | bdl |
| bdl | 449 | bdl | bdl | bdl | 0.000 | 0.67 | 24 | bdl |
| bdl | 485 | bdl | bdl | bdl | 0.001 | 0.67 | 25 | bdl |
| bdl | 485 | bdl | bdl | bdl | 0.000 | 0.14 | 23 | bdl |
| bdl | 440 | bdl | bdl | bdl | bdl | 0.06 | 21 | bdl |
| bdl | 423 | bdl | bdl | bdl | bdl | 0.04 | 20 | bdl |
| bdl | 407 | bdl | bdl | bdl | bdl | 0.04 | 19 | bdl |
| bdl | 388 | bdl | bdl | bdl | bdl | 0.08 | 18 | bdl |
| bdl | 411 | bdl | bdl | bdl | bdl | 0.08 | 24 | bdl |
| bdl | 355 | bdl | bdl | bdl | bdl | 0.08 | 20 | bdl |
| bdl | 413 | bdl | bdl | bdl | bdl | 0.04 | 21 | bdl |
| bdl | 389 | bdl | bdl | bdl | bdl | 0.02 | 19 | bdl |
| bdl | 334 | bdl | bdl | bdl | bdl | 0.04 | 16 | bdl |
| 0.05 | 569 | 0.02 | bdl | bdl | bdl | 93.45 | Sat | 0.03 |
| 0.06 | 577 | 0.02 | bdl | bdl | 0.001 | 101.22 | Sat | 0.03 |
| 0.04 | 547 | bdl | bdl | bdl | 0.089 | 79.54 | 51 | 0.06 |
| 0.04 | 568 | bdl | bdl | bdl | 0.089 | 71.16 | 49 | 0.05 |
| 0.05 | 579 | bdl | bdl | bdl | 0.091 | 63.20 | 51 | 0.05 |
| 0.05 | 583 | bdl | bdl | bdl | 0.091 | 56.16 | 48 | 0.05 |
| 0.06 | 592 | bdl | bdl | bdl | 0.092 | 52.29 | 47 | 0.05 |
| 0.06 | 582 | bdl | bdl | bdl | 0.091 | 52.05 | 43 | 0.04 |
| 0.06 | 577 | bdl | bdl | bdl | 0.091 | 44.61 | 40 | 0.04 |
| 0.06 | 568 | bdl | bdl | bdl | 0.088 | 43.98 | 40 | 0.04 |
| 0.07 | 587 | bdl | bdl | bdl | 0.093 | 40.11 | 41 | 0.04 |
| 0.07 | 585 | bdl | bdl | bdl | 0.091 | 36.33 | 38 | 0.04 |
| 0.07 | 586 | bdl | bdl | bdl | 0.094 | 34.38 | 38 | 0.04 |
| 0.11 | 580 | bdl | bdl | bdl | 0.002 | 46.67 | Sat | 0.02 |
| 0.10 | 573 | bdl | bdl | bdl | 0.004 | 41.58 | Sat | 0.02 |
| 0.10 | 541 | bdl | bdl | bdl | bdl | 33.99 | Sat | 0.01 |
| 0.10 | 541 | bdl | bdl | bdl | bdl | 30.23 | Sat | 0.01 |
| 0.15 | 609 | bdl | bdl | bdl | 0.002 | 28.94 | 100 | 0.03 |
| 0.15 | 614 | bdl | bdl | bdl | 0.003 | 23.24 | 93 | 0.03 |
| 0.16 | 617 | bdl | bdl | bdl | 0.002 | 20.46 | 93 | 0.03 |
| 0.15 | 618 | bdl | bdl | bdl | 0.001 | 17.45 | 80 | 0.03 |
| 0.15 | 625 | bdl | bdl | bdl | 0.002 | 15.20 | 84 | 0.03 |
| 0.15 | 625 | bdl | bdl | bdl | 0.003 | 13.74 | 78 | 0.02 |
| 0.14 | 619 | bdl | bdl | bdl | 0.002 | 11.95 | 70 | 0.02 |
| 0.15 | 682 | bdl | bdl | bdl | 0.002 | 10.97 | 75 | 0.02 |
| 0.14 | 623 | bdl | bdl | bdl | 0.003 | 8.10 | 63 | 0.02 |
| 0.14 | 621 | bdl | bdl | bdl | 0.001 | 6.77 | 60 | 0.02 |
| 0.14 | 624 | bdl | bdl | bdl | 0.002 | 5.54 | 58 | 0.02 |
| bdl | 545 | bdl | bdl | bdl | 0.001 | 4.17 | 30 | bdl |
| bdl | 537 | bdl | bdl | bdl | 0.001 | 3.28 | 28 | bdl |
| bdl | 531 | bdl | bdl | bdl | 0.000 | 2.55 | 27 | bdl |
| bdl | 535 | bdl | bdl | bdl | 0.001 | 2.16 | 26 | bdl |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 17.5 | 3.2 | bdl | 17.3 | bdl | bdl | bdl | 549 | bdl |
| 17.3 | 2.8 | bdl | Sat | bdl | bdl | bdl | 399 | bdl |
| 16.8 | 2.7 | bdl | 74.1 | bdl | bdl | bdl | 387 | bdl |
| 16.0 | 2.4 | bdl | 70.8 | bdl | bdl | bdl | 361 | bdl |
| 16.6 | 2.6 | bdl | 71.6 | bdl | bdl | bdl | 355 | bdl |
| 16.4 | 2.6 | bdl | 71.0 | bdl | bdl | bdl | 345 | bdl |
| 15.9 | 2.4 | bdl | Sat | bdl | bdl | bdl | 336 | bdl |
| 17.0 | 2.6 | bdl | Sat | bdl | bdl | bdl | 370 | bdl |
| 16.3 | 2.5 | bdl | 74.2 | bdl | bdl | bdl | 350 | bdl |
| 15.8 | 2.3 | bdl | 72.7 | bdl | 0.000 | bdl | 345 | bdl |
| 15.4 | 2.3 | bdl | 72.0 | bdl | 0.009 | bdl | 343 | bdl |
| 16.6 | 2.4 | bdl | Sat | bdl | 0.004 | bdl | 376 | bdl |
| 15.8 | 1.5 | bdl | Sat | bdl | 0.000 | bdl | 379 | bdl |
| 14.7 | 1.4 | bdl | Sat | bdl | bdl | bdl | 347 | bdl |
| 13.9 | 1.4 | bdl | Sat | bdl | bdl | bdl | 340 | bdl |
| 13.0 | 1.3 | bdl | 60.4 | bdl | 0.001 | bdl | 320 | bdl |
| 12.2 | 1.1 | bdl | Sat | bdl | bdl | bdl | 309 | bdl |
| 13.5 | 1.1 | bdl | Sat | bdl | 0.000 | bdl | 324 | bdl |
| 11.0 | 0.8 | bdl | Sat | bdl | bdl | bdl | 280 | bdl |
| 12.3 | 0.9 | bdl | Sat | bdl | 0.006 | bdl | 326 | bdl |
| 11.5 | 0.8 | bdl | Sat | bdl | 0.000 | bdl | 303 | bdl |
| 10.3 | 0.6 | bdl | Sat | bdl | bdl | bdl | 263 | bdl |
| 64.4 | 19.4 | bdl | Sat | bdl | bdl | bdl | 334 | bdl |
| 66.6 | 19.3 | bdl | Sat | bdl | bdl | bdl | 331 | bdl |
| 54.9 | 17.1 | bdl | 25.1 | bdl | bdl | bdl | 681 | bdl |
| 53.2 | 16.2 | bdl | 24.4 | bdl | bdl | bdl | 696 | bdl |
| 50.3 | 15.2 | bdl | 25.4 | bdl | bdl | bdl | 697 | bdl |
| 48.1 | 14.4 | bdl | 23.7 | bdl | bdl | bdl | 693 | bdl |
| 47.1 | 14.0 | bdl | 23.8 | bdl | bdl | bdl | 695 | bdl |
| 43.2 | 13.2 | bdl | 22.0 | bdl | bdl | bdl | 695 | bdl |
| 41.1 | 12.7 | bdl | 21.0 | bdl | bdl | bdl | 677 | bdl |
| 42.3 | 13.1 | bdl | 20.4 | bdl | bdl | bdl | 674 | bdl |
| 40.1 | 12.5 | bdl | 21.5 | bdl | bdl | bdl | 693 | bdl |
| 38.5 | 11.8 | bdl | 20.2 | bdl | bdl | bdl | 686 | bdl |
| 37.8 | 11.5 | bdl | 20.2 | bdl | bdl | bdl | 687 | bdl |
| 54.8 | 15.1 | bdl | Sat | bdl | bdl | bdl | 306 | bdl |
| 50.0 | 14.1 | bdl | Sat | bdl | bdl | bdl | 295 | bdl |
| 44.7 | 12.4 | bdl | Sat | bdl | bdl | bdl | 276 | bdl |
| 42.1 | 11.6 | bdl | Sat | bdl | bdl | bdl | 273 | bdl |
| 41.4 | 12.0 | bdl | 20.5 | bdl | bdl | bdl | 647 | bdl |
| 37.1 | 10.6 | bdl | 19.5 | bdl | bdl | bdl | 635 | bdl |
| 35.1 | 10.0 | bdl | 20.0 | bdl | bdl | bdl | 633 | bdl |
| 31.6 | 9.1 | bdl | 17.6 | bdl | bdl | bdl | 621 | bdl |
| 29.4 | 8.5 | bdl | 18.9 | bdl | bdl | bdl | 627 | bdl |
| 28.3 | 8.1 | bdl | 17.6 | bdl | bdl | bdl | 614 | bdl |
| 26.4 | 7.6 | bdl | 15.9 | bdl | bdl | bdl | 609 | bdl |
| 25.8 | 7.6 | bdl | 17.6 | bdl | bdl | bdl | 671 | bdl |
| 21.9 | 6.2 | bdl | 15.2 | bdl | bdl | bdl | 605 | bdl |
| 20.1 | 5.7 | bdl | 14.8 | bdl | bdl | bdl | 593 | bdl |
| 19.4 | 5.4 | bdl | 14.7 | bdl | bdl | bdl | 592 | bdl |
| 18.7 | 4.5 | bdl | Sat | bdl | 0.010 | bdl | 445 | bdl |
| 17.2 | 4.0 | bdl | 63.5 | bdl | 0.005 | bdl | 434 | bdl |
| 16.2 | 3.7 | bdl | 62.4 | bdl | 0.002 | bdl | 430 | bdl |
| 15.5 | 3.4 | bdl | Sat | bdl | 0.006 | bdl | 431 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.17 | 3.3 | 0.62 | bdl | bdl | bdl | 2.71 |
| 0.05 | 3.3 | 0.39 | bdl | bdl | 0.003 | 2.45 |
| 0.04 | 3.2 | 0.37 | bdl | bdl | 0.001 | 2.38 |
| 0.05 | 3.1 | 0.35 | bdl | bdl | 0.002 | 2.04 |
| 0.04 | 3.1 | 0.35 | bdl | bdl | 0.002 | 2.26 |
| 0.03 | 3.1 | 0.34 | bdl | bdl | 0.002 | 2.30 |
| 0.04 | 3.1 | 0.32 | bdl | bdl | 0.002 | 2.04 |
| 0.04 | 3.3 | 0.34 | bdl | bdl | 0.001 | 1.50 |
| 0.05 | 3.3 | 0.33 | bdl | bdl | 0.005 | 1.96 |
| 0.03 | 3.4 | 0.33 | bdl | bdl | 0.005 | 1.86 |
| 0.02 | 3.3 | 0.32 | bdl | bdl | 0.005 | 1.85 |
| 0.02 | 3.6 | 0.35 | bdl | bdl | 0.010 | 1.91 |
| 0.02 | 3.6 | 0.33 | bdl | bdl | 0.006 | 0.28 |
| 0.02 | 3.2 | 0.29 | bdl | bdl | 0.004 | 0.19 |
| 0.03 | 2.9 | 0.26 | bdl | bdl | 0.002 | 0.16 |
| 0.03 | 2.8 | 0.25 | bdl | bdl | 0.001 | 0.15 |
| 0.02 | 2.6 | 0.23 | bdl | bdl | bdl | 0.13 |
| 0.02 | 2.7 | 0.25 | bdl | bdl | 0.002 | 0.13 |
| 0.02 | 2.3 | 0.20 | bdl | bdl | bdl | 0.11 |
| 0.02 | 2.7 | 0.24 | bdl | bdl | 0.007 | 0.12 |
| 0.02 | 2.6 | 0.22 | bdl | bdl | 0.006 | 0.10 |
| 0.02 | 2.3 | 0.19 | bdl | bdl | 0.002 | 0.08 |
| 0.13 | 5.0 | 0.93 | bdl | bdl | bdl | 84.16 |
| 0.13 | 5.4 | 1.00 | bdl | bdl | bdl | 75.20 |
| 0.15 | 9.3 | 0.74 | bdl | bdl | bdl | 57.72 |
| 0.13 | 9.4 | 0.75 | bdl | bdl | bdl | 52.59 |
| 0.12 | 9.3 | 0.77 | bdl | bdl | bdl | 46.87 |
| 0.12 | 9.1 | 0.76 | bdl | bdl | bdl | 42.59 |
| 0.12 | 8.9 | 0.75 | bdl | bdl | bdl | 40.57 |
| 0.13 | 8.6 | 0.70 | bdl | bdl | bdl | 45.99 |
| 0.12 | 8.2 | 0.67 | bdl | bdl | bdl | 41.84 |
| 0.13 | 8.2 | 0.67 | bdl | bdl | bdl | 43.88 |
| 0.12 | 8.2 | 0.66 | bdl | bdl | bdl | 42.16 |
| 0.13 | 8.0 | 0.63 | bdl | bdl | bdl | 39.13 |
| 0.09 | 7.9 | 0.65 | bdl | bdl | bdl | 37.78 |
| 0.10 | 4.0 | 0.81 | bdl | bdl | bdl | 56.83 |
| 0.11 | 3.8 | 0.77 | bdl | bdl | bdl | 53.64 |
| 0.10 | 3.5 | 0.72 | bdl | bdl | bdl | 44.32 |
| 0.11 | 3.4 | 0.70 | bdl | bdl | bdl | 40.55 |
| 0.19 | 3.7 | 1.02 | bdl | bdl | bdl | 43.28 |
| 0.18 | 3.6 | 0.95 | bdl | bdl | bdl | 35.41 |
| 0.26 | 3.6 | 0.97 | bdl | bdl | bdl | 32.22 |
| 0.13 | 3.4 | 0.87 | bdl | bdl | bdl | 28.10 |
| 0.21 | 3.4 | 0.88 | bdl | bdl | bdl | 25.40 |
| 0.21 | 3.3 | 0.86 | bdl | bdl | bdl | 24.01 |
| 0.14 | 3.2 | 0.78 | bdl | bdl | bdl | 21.81 |
| 0.19 | 3.3 | 0.81 | bdl | bdl | bdl | 20.93 |
| 0.15 | 3.1 | 0.75 | bdl | bdl | bdl | 16.31 |
| 0.19 | 2.9 | 0.71 | bdl | bdl | bdl | 14.46 |
| 0.21 | 3.0 | 0.71 | bdl | bdl | bdl | 13.06 |
| 0.03 | 3.0 | 0.47 | bdl | bdl | 0.003 | 10.94 |
| 0.04 | 2.9 | 0.44 | bdl | bdl | 0.002 | 9.52 |
| 0.03 | 2.8 | 0.42 | bdl | bdl | 0.002 | 8.42 |
| 0.03 | 2.8 | 0.42 | bdl | bdl | 0.002 | 7.67 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Ore S-oxidizer | 33 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 34 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 34 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore S-oxidizer | 35 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore S-oxidizer | 36 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore S-oxidizer | 37 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore S-oxidizer | 38 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore S-oxidizer | 39 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 40 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 41 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 42 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 43 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 44 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 45 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 46 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 48 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore S-oxidizer | 49 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 3 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 5 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 13 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 14 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 15 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 18 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 22 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 23 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 24 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 27 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Ore Sterile | 29 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 30 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 31 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 32 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 33 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 34 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 35 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 35 | bdl | bdl | bdl | bdl | 0.01 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| bdl | 539 | bdl | bdl | bdl | 0.000 | 1.61 | 25 | bdl |
| bdl | 555 | bdl | bdl | bdl | 0.000 | 1.28 | 25 | bdl |
| bdl | 573 | bdl | bdl | bdl | 0.000 | bdl | 25 | bdl |
| bdl | 594 | bdl | bdl | bdl | 0.002 | 0.96 | 24 | bdl |
| bdl | 576 | bdl | bdl | bdl | 0.000 | 0.67 | 26 | bdl |
| bdl | 604 | bdl | bdl | bdl | 0.000 | 0.54 | 26 | bdl |
| bdl | 613 | bdl | bdl | bdl | 0.001 | 0.48 | 26 | bdl |
| bdl | 422 | bdl | bdl | bdl | 0.001 | 0.15 | 18 | bdl |
| bdl | 368 | bdl | bdl | bdl | 0.000 | 0.07 | 17 | bdl |
| bdl | 309 | bdl | bdl | bdl | bdl | 0.06 | 16 | bdl |
| bdl | 256 | bdl | bdl | bdl | bdl | 0.17 | 15 | bdl |
| bdl | 174 | bdl | bdl | bdl | bdl | 0.10 | 14 | bdl |
| bdl | 159 | bdl | bdl | bdl | bdl | 0.14 | 15 | bdl |
| bdl | 123 | bdl | bdl | bdl | bdl | 0.02 | 13 | bdl |
| bdl | 133 | bdl | bdl | bdl | bdl | 0.02 | 17 | bdl |
| bdl | 115 | bdl | bdl | bdl | bdl | 0.02 | 16 | bdl |
| bdl | 91 | bdl | bdl | bdl | bdl | 0.04 | 14 | bdl |
| 0.07 | 350 | 0.01 | bdl | bdl | 0.003 | 37.92 | 44 | 0.03 |
| 0.06 | 420 | 0.00 | bdl | bdl | 0.009 | 28.25 | 47 | 0.03 |
| 0.02 | 197 | bdl | bdl | bdl | 0.052 | 9.11 | 0 | 0.03 |
| 0.03 | 405 | bdl | bdl | bdl | 0.093 | 13.92 | 19 | 0.05 |
| 0.04 | 425 | bdl | bdl | bdl | 0.095 | 12.55 | 21 | 0.05 |
| 0.04 | 345 | bdl | bdl | bdl | 0.095 | 6.99 | 16 | 0.03 |
| 0.03 | 324 | bdl | bdl | bdl | 0.094 | 6.47 | 15 | 0.03 |
| 0.04 | 269 | bdl | bdl | bdl | 0.092 | 4.53 | 14 | 0.02 |
| 0.05 | 439 | bdl | bdl | bdl | 0.096 | 7.65 | 17 | 0.04 |
| 0.04 | 455 | bdl | bdl | bdl | 0.091 | 9.33 | 17 | 0.04 |
| 0.04 | 446 | bdl | bdl | bdl | 0.092 | 7.58 | 16 | 0.04 |
| 0.04 | 432 | bdl | bdl | bdl | 0.092 | 5.85 | 15 | 0.03 |
| 0.04 | 415 | bdl | bdl | bdl | 0.095 | 5.14 | 15 | 0.03 |
| 0.06 | 428 | bdl | bdl | bdl | 0.002 | 4.76 | 33 | 0.01 |
| 0.06 | 341 | bdl | bdl | bdl | 0.001 | 1.84 | 25 | 0.01 |
| 0.05 | 313 | bdl | bdl | bdl | bdl | 1.47 | 24 | 0.01 |
| 0.05 | 308 | bdl | bdl | bdl | bdl | 1.05 | 23 | 0.01 |
| 0.08 | 296 | bdl | bdl | bdl | 0.002 | 1.11 | 30 | 0.02 |
| 0.08 | 328 | bdl | bdl | bdl | 0.002 | 0.93 | 30 | 0.02 |
| 0.08 | 303 | bdl | bdl | bdl | 0.001 | 0.86 | 29 | 0.01 |
| 0.07 | 291 | bdl | bdl | bdl | 0.002 | 0.71 | 27 | 0.01 |
| 0.08 | 279 | bdl | bdl | bdl | 0.003 | 0.61 | 29 | 0.01 |
| 0.07 | 262 | bdl | bdl | bdl | 0.002 | 0.51 | 26 | 0.01 |
| 0.07 | 254 | bdl | bdl | bdl | 0.001 | 0.39 | 25 | 0.01 |
| 0.07 | 227 | bdl | bdl | bdl | 0.002 | 0.30 | 23 | 0.01 |
| 0.08 | 223 | bdl | bdl | bdl | 0.002 | 0.21 | 24 | 0.01 |
| 0.07 | 184 | bdl | bdl | bdl | 0.001 | 0.16 | 31 | 0.01 |
| 0.08 | 215 | bdl | bdl | bdl | 0.001 | 0.18 | 22 | 0.01 |
| bdl | 203 | bdl | bdl | bdl | 0.001 | 0.16 | 12 | bdl |
| bdl | 202 | bdl | bdl | bdl | 0.000 | 0.16 | 12 | bdl |
| bdl | 214 | bdl | bdl | bdl | 0.000 | 0.16 | 12 | bdl |
| bdl | 213 | bdl | bdl | bdl | 0.000 | 0.19 | 12 | bdl |
| bdl | 210 | bdl | bdl | bdl | 0.000 | 0.14 | 12 | bdl |
| bdl | 211 | bdl | bdl | bdl | 0.000 | 0.15 | 12 | bdl |
| bdl | 240 | bdl | bdl | bdl | 0.000 | bdl | 13 | bdl |
| bdl | 243 | bdl | bdl | bdl | 0.002 | 0.18 | 13 | bdl |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 14.6 | 3.0 | bdl | 63.0 | bdl | 0.001 | bdl | 430 | bdl |
| 14.3 | 2.8 | bdl | 65.4 | bdl | 0.002 | bdl | 437 | bdl |
| 14.1 | 2.6 | bdl | Sat | bdl | bdl | bdl | 461 | bdl |
| 14.0 | 2.5 | bdl | 68.0 | bdl | bdl | bdl | 466 | bdl |
| 13.3 | 2.2 | bdl | 66.8 | bdl | 0.014 | bdl | 454 | bdl |
| 13.2 | 2.1 | bdl | Sat | bdl | 0.013 | bdl | 465 | bdl |
| 13.4 | 2.0 | bdl | Sat | bdl | 0.009 | bdl | 474 | bdl |
| 12.4 | 0.4 | bdl | 68.9 | bdl | 0.008 | bdl | 326 | bdl |
| 10.6 | 0.4 | bdl | 62.9 | bdl | 0.001 | bdl | 284 | bdl |
| 10.5 | 0.4 | bdl | 58.0 | bdl | 0.002 | bdl | 239 | bdl |
| 10.2 | 0.3 | bdl | 55.0 | bdl | 0.005 | bdl | 193 | bdl |
| 9.2 | 0.2 | bdl | Sat | bdl | 0.004 | bdl | 131 | bdl |
| 9.8 | 0.2 | bdl | Sat | bdl | bdl | bdl | 116 | bdl |
| 8.8 | 0.1 | bdl | Sat | bdl | 0.000 | bdl | 88 | bdl |
| 10.7 | 0.2 | bdl | Sat | bdl | 0.006 | bdl | 93 | bdl |
| 10.4 | 0.1 | bdl | Sat | bdl | 0.006 | bdl | 77 | bdl |
| 9.4 | 0.1 | bdl | Sat | bdl | 0.005 | bdl | 59 | bdl |
| 58.5 | 11.7 | bdl | Sat | bdl | bdl | bdl | 202 | bdl |
| 56.6 | 11.4 | bdl | Sat | bdl | bdl | bdl | 233 | bdl |
| 22.6 | 5.1 | bdl |  | bdl | bdl | bdl | 237 | bdl |
| 44.5 | 9.6 | bdl | 32.0 | bdl | bdl | bdl | 479 | bdl |
| 47.8 | 9.9 | bdl | 34.9 | bdl | bdl | bdl | 514 | bdl |
| 32.6 | 6.7 | bdl | 24.4 | bdl | bdl | bdl | 404 | bdl |
| 29.7 | 6.2 | bdl | 22.3 | bdl | bdl | bdl | 383 | bdl |
| 24.4 | 4.9 | bdl | 19.9 | bdl | bdl | bdl | 335 | bdl |
| 33.3 | 7.2 | bdl | 21.4 | bdl | bdl | bdl | 523 | bdl |
| 34.1 | 7.8 | bdl | 20.0 | bdl | bdl | bdl | 552 | bdl |
| 28.7 | 7.5 | bdl | 19.1 | bdl | bdl | bdl | 531 | bdl |
| 23.2 | 6.5 | bdl | 17.7 | bdl | bdl | bdl | 502 | bdl |
| 19.8 | 6.0 | bdl | 17.0 | bdl | bdl | bdl | 486 | bdl |
| 22.3 | 6.5 | bdl | Sat | bdl | bdl | bdl | 212 | bdl |
| 14.0 | 4.6 | bdl | Sat | bdl | bdl | bdl | 159 | bdl |
| 12.5 | 4.1 | bdl | 27 | bdl | bdl | bdl | 146 | bdl |
| 12.0 | 3.9 | bdl | 27 | bdl | bdl | bdl | 143 | bdl |
| 11.9 | 3.8 | bdl | 13.6 | bdl | bdl | bdl | 288 | bdl |
| 12.1 | 4.0 | bdl | 13.7 | bdl | bdl | bdl | 316 | bdl |
| 11.2 | 3.6 | bdl | 13.6 | bdl | bdl | bdl | 294 | bdl |
| 10.5 | 3.4 | bdl | 13.0 | bdl | bdl | bdl | 282 | bdl |
| 10.0 | 3.2 | bdl | 13.9 | bdl | bdl | bdl | 269 | bdl |
| 9.6 | 3.0 | bdl | 12.6 | bdl | bdl | bdl | 252 | bdl |
| 9.1 | 2.8 | bdl | 11.9 | bdl | bdl | bdl | 241 | bdl |
| 8.4 | 2.4 | bdl | 11.4 | bdl | bdl | bdl | 214 | bdl |
| 7.8 | 2.3 | bdl | 11.6 | bdl | bdl | bdl | 206 | bdl |
| 7.1 | 1.9 | bdl | 17.7 | bdl | bdl | bdl | 184 | bdl |
| 7.9 | 2.2 | bdl | 10.9 | bdl | bdl | bdl | 200 | bdl |
| 7.8 | 2.0 | bdl | 50.1 | bdl | bdl | bdl | 166 | bdl |
| 7.7 | 2.0 | bdl | 49.9 | bdl | bdl | bdl | 164 | bdl |
| 7.8 | 2.0 | bdl | 49.8 | bdl | bdl | bdl | 175 | bdl |
| 7.6 | 2.0 | bdl | 50.2 | bdl | bdl | bdl | 171 | bdl |
| 7.4 | 1.9 | bdl | 49.3 | bdl | bdl | bdl | 169 | bdl |
| 7.2 | 1.9 | bdl | 49.5 | bdl | bdl | bdl | 170 | bdl |
| 7.8 | 2.1 | bdl | Sat | bdl | bdl | bdl | 202 | bdl |
| 7.6 | 2.1 | bdl | 56.4 | bdl | bdl | bdl | 195 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.04 | 2.7 | 0.40 | bdl | bdl | 0.002 | 6.63 |
| 0.04 | 2.8 | 0.40 | bdl | bdl | 0.002 | 6.03 |
| 0.04 | 2.6 | 0.41 | bdl | bdl | 0.001 | 2.28 |
| 0.03 | 2.9 | 0.41 | bdl | bdl | 0.006 | 5.16 |
| 0.03 | 3.0 | 0.41 | bdl | bdl | 0.004 | 4.47 |
| 0.03 | 3.1 | 0.41 | bdl | bdl | 0.007 | 4.18 |
| 0.02 | 3.1 | 0.42 | bdl | bdl | 0.008 | 3.99 |
| 0.02 | 2.1 | 0.24 | bdl | bdl | 0.007 | 0.34 |
| 0.02 | 1.9 | 0.20 | bdl | bdl | 0.006 | 0.33 |
| 0.02 | 1.7 | 0.17 | bdl | bdl | 0.002 | 0.34 |
| 0.02 | 1.6 | 0.14 | bdl | bdl | 0.002 | 0.28 |
| 0.02 | 1.3 | 0.10 | bdl | bdl | bdl | 0.17 |
| 0.02 | 1.4 | 0.09 | bdl | bdl | 0.001 | 0.15 |
| 0.01 | 1.2 | 0.07 | bdl | bdl | bdl | 0.10 |
| 0.01 | 1.5 | 0.08 | bdl | bdl | 0.007 | 0.10 |
| 0.01 | 1.4 | 0.07 | bdl | bdl | 0.006 | 0.09 |
| 0.01 | 1.3 | 0.06 | bdl | bdl | 0.003 | 0.07 |
| 0.12 | 4.3 | 0.78 | bdl | bdl | bdl | 4.04 |
| 0.12 | 4.2 | 0.83 | bdl | bdl | bdl | 4.25 |
| 0.04 | 4.5 | 0.32 | bdl | bdl | bdl | 1.37 |
| 0.10 | 8.5 | 0.57 | bdl | bdl | bdl | 2.33 |
| 0.10 | 8.7 | 0.61 | bdl | bdl | bdl | 2.16 |
| 0.08 | 7.9 | 0.49 | bdl | bdl | bdl | 0.88 |
| 0.05 | 7.7 | 0.46 | bdl | bdl | bdl | 0.84 |
| 0.07 | 5.3 | 0.36 | bdl | bdl | bdl | 2.03 |
| 0.07 | 8.2 | 0.62 | bdl | bdl | bdl | 2.65 |
| 0.08 | 9.2 | 0.69 | bdl | bdl | bdl | 3.16 |
| 0.08 | 8.7 | 0.66 | bdl | bdl | bdl | 3.86 |
| 0.12 | 8.4 | 0.60 | bdl | bdl | bdl | 3.55 |
| 0.06 | 8.0 | 0.53 | bdl | bdl | bdl | 3.35 |
| 0.08 | 3.3 | 0.71 | bdl | bdl | bdl | 7.74 |
| 0.09 | 3.0 | 0.51 | bdl | bdl | bdl | 3.51 |
| 0.06 | 2.8 | 0.46 | bdl | bdl | bdl | 3.13 |
| 0.05 | 2.7 | 0.45 | bdl | bdl | bdl | 2.61 |
| 0.14 | 2.9 | 0.64 | bdl | bdl | bdl | 2.90 |
| 0.12 | 3.0 | 0.62 | bdl | bdl | bdl | 2.85 |
| 0.16 | 2.8 | 0.59 | bdl | bdl | bdl | 2.62 |
| 0.12 | 2.7 | 0.52 | bdl | bdl | bdl | 2.34 |
| 0.08 | 2.6 | 0.52 | bdl | bdl | bdl | 2.18 |
| 0.19 | 2.4 | 0.46 | bdl | bdl | bdl | 1.96 |
| 0.05 | 2.3 | 0.42 | bdl | bdl | bdl | 1.63 |
| 0.12 | 2.1 | 0.38 | bdl | bdl | bdl | 1.29 |
| 0.12 | 2.0 | 0.36 | bdl | bdl | bdl | 1.14 |
| 0.04 | 1.8 | 0.36 | bdl | bdl | bdl | 0.87 |
| 0.10 | 2.1 | 0.37 | bdl | bdl | bdl | 0.96 |
| 0.03 | 2.1 | 0.21 | bdl | bdl | 0.002 | 0.85 |
| 0.03 | 2.0 | 0.21 | bdl | bdl | 0.002 | 0.83 |
| 0.04 | 2.1 | 0.23 | bdl | bdl | 0.002 | 0.84 |
| 0.02 | 2.1 | 0.22 | bdl | bdl | 0.001 | 0.82 |
| 0.03 | 2.1 | 0.21 | bdl | bdl | 0.001 | 0.70 |
| 0.03 | 2.1 | 0.22 | bdl | bdl | 0.002 | 0.68 |
| 0.03 | 2.4 | 0.25 | bdl | bdl | 0.002 | 0.59 |
| 0.03 | 2.4 | 0.24 | bdl | bdl | 0.007 | 0.72 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Ore Sterile | 36 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 37 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 38 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 40 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 40 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Ore Sterile | 41 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 42 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 43 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 45 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 46 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 47 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 48 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Ore Sterile | 49 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 3 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 5 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 13 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 14 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 15 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 18 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 22 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 23 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 24 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 29 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 30 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 31 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 32 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 33 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 34 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 36 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 37 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 39 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 42 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 44 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 45 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 46 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 47 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Control | 48 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Control | 49 | bdl | bdl | bdl | bdl | 0.00 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| bdl | 242 | bdl | bdl | bdl | 0.000 | 0.15 | 15 | bdl |
| bdl | 243 | bdl | bdl | bdl | 0.001 | 0.14 | 15 | bdl |
| bdl | 227 | bdl | bdl | bdl | bdl | 0.17 | 14 | bdl |
| bdl | 249 | bdl | bdl | bdl | bdl | 0.29 | 18 | bdl |
| bdl | 251 | bdl | bdl | bdl | 0.000 | 0.11 | 16 | bdl |
| bdl | 195 | bdl | bdl | bdl | bdl | 0.06 | 12 | bdl |
| bdl | 203 | bdl | bdl | bdl | bdl | 0.11 | 12 | bdl |
| bdl | 194 | bdl | bdl | bdl | bdl | 0.12 | 24 | bdl |
| bdl | 209 | bdl | bdl | bdl | bdl | 0.09 | 18 | bdl |
| bdl | 220 | bdl | bdl | bdl | bdl | 0.05 | 16 | bdl |
| bdl | 206 | bdl | bdl | bdl | bdl | 0.02 | 15 | bdl |
| bdl | 202 | bdl | bdl | bdl | bdl | 0.03 | 14 | bdl |
| bdl | 188 | bdl | bdl | bdl | bdl | 0.02 | 12 | bdl |
| 0.08 | 493 | 0.06 | bdl | bdl | bdl | 256.57 | Sat | 0.02 |
| 0.07 | 554 | 0.00 | bdl | bdl | 0.011 | 17.24 | Sat | 0.01 |
| 0.05 | 551 | bdl | bdl | bdl | 0.096 | 12.38 | 37 | 0.02 |
| 0.04 | 537 | bdl | bdl | bdl | 0.096 | 8.82 | 32 | 0.02 |
| 0.04 | 533 | bdl | bdl | bdl | 0.095 | 7.42 | 29 | 0.02 |
| 0.04 | 559 | bdl | bdl | bdl | 0.097 | 6.28 | 28 | 0.02 |
| 0.04 | 555 | bdl | bdl | bdl | 0.095 | 5.17 | 26 | 0.02 |
| 0.04 | 591 | bdl | bdl | bdl | 0.131 | 1.06 | 27 | 0.02 |
| 0.05 | 533 | bdl | bdl | bdl | 0.246 | 6.40 | 20 | 0.01 |
| 0.06 | 532 | bdl | bdl | bdl | 0.355 | 21.92 | 18 | 0.01 |
| 0.02 | 253 | bdl | bdl | bdl | 0.083 | 1.71 | 0 | 0.01 |
| 0.04 | 515 | bdl | bdl | bdl | 0.131 | 1.21 | 18 | 0.01 |
| 0.04 | 499 | bdl | bdl | bdl | 0.145 | 1.94 | 17 | 0.01 |
| 0.06 | 548 | bdl | bdl | bdl | 0.061 | 1.36 | 39 | 0.01 |
| 0.05 | 477 | bdl | bdl | bdl | 0.140 | 11.04 | 34 | 0.00 |
| 0.05 | 482 | bdl | bdl | bdl | 0.065 | 2.21 | 34 | 0.00 |
| 0.05 | 480 | bdl | bdl | bdl | 0.028 | 0.85 | 32 | 0.00 |
| 0.08 | 596 | bdl | bdl | bdl | 0.161 | 5.26 | 48 | 0.01 |
| 0.10 | 630 | bdl | bdl | bdl | 0.029 | 0.56 | 48 | 0.01 |
| 0.08 | 489 | bdl | bdl | bdl | 0.153 | 3.02 | 34 | 0.01 |
| 0.08 | 459 | bdl | bdl | bdl | 0.012 | 0.24 | 32 | 0.01 |
| 0.10 | 289 | bdl | bdl | bdl | 0.006 | 0.09 | 26 | 0.01 |
| 0.12 | 215 | bdl | bdl | bdl | 0.007 | 0.05 | 27 | 0.01 |
| 0.16 | 171 | bdl | bdl | bdl | 0.046 | 1.81 | 28 | 0.00 |
| 0.16 | 116 | bdl | bdl | bdl | 0.066 | 1.00 | 26 | 0.00 |
| bdl | 87 | bdl | bdl | bdl | 0.066 | 4.47 | 13 | bdl |
| bdl | 65 | bdl | bdl | bdl | 0.025 | 0.82 | 13 | bdl |
| bdl | 54 | bdl | bdl | bdl | 0.017 | 0.32 | 15 | bdl |
| bdl | 45 | bdl | bdl | bdl | 0.031 | 1.22 | 13 | bdl |
| bdl | 43 | bdl | bdl | bdl | 0.030 | 1.06 | 13 | bdl |
| bdl | 44 | bdl | bdl | bdl | 0.023 | 0.57 | 14 | bdl |
| bdl | 44 | bdl | bdl | bdl | 0.021 | 0.66 | 16 | bdl |
| bdl | 53 | bdl | bdl | bdl | bdl | 3.80 | 21 | bdl |
| bdl | 46 | bdl | bdl | bdl | 0.080 | 1.68 | 18 | bdl |
| bdl | 31 | bdl | bdl | bdl | 0.006 | 0.07 | 13 | bdl |
| bdl | 31 | bdl | bdl | bdl | 0.007 | 0.14 | 13 | bdl |
| bdl | 35 | bdl | bdl | bdl | 0.008 | 0.06 | 19 | bdl |
| bdl | 26 | bdl | bdl | bdl | 0.011 | 0.07 | 15 | bdl |
| bdl | 29 | bdl | bdl | bdl | 0.007 | 0.06 | 13 | bdl |
| bdl | 28 | bdl | bdl | bdl | 0.041 | 1.47 | 11 | bdl |
| bdl | 26 | bdl | bdl | bdl | 0.003 | 0.01 | 11 | bdl |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 7.4 | 2.0 | bdl | 56.8 | bdl | 0.008 | bdl | 194 | bdl |
| 7.2 | 2.0 | bdl | 57.2 | bdl | 0.010 | bdl | 191 | bdl |
| 6.7 | 1.8 | bdl | 52.6 | bdl | 0.005 | bdl | 180 | bdl |
| 10.0 | 2.0 | bdl | 59.6 | bdl | 0.006 | bdl | 183 | bdl |
| 9.3 | 1.9 | bdl | Sat | bdl | 0.004 | bdl | 181 | bdl |
| 6.8 | 1.4 | bdl | 46.4 | bdl | 0.004 | bdl | 148 | bdl |
| 7.0 | 1.4 | bdl | 48.3 | bdl | 0.002 | bdl | 154 | bdl |
| 7.0 | 1.3 | bdl | Sat | bdl | bdl | bdl | 145 | bdl |
| 7.0 | 1.3 | bdl | Sat | bdl | 0.006 | bdl | 159 | bdl |
| 8.0 | 1.4 | bdl | Sat | bdl | 0.004 | bdl | 164 | bdl |
| 8.0 | 1.2 | bdl | Sat | bdl | 0.007 | bdl | 156 | bdl |
| 7.9 | 1.2 | bdl | Sat | bdl | 0.012 | bdl | 151 | bdl |
| 7.5 | 1.0 | bdl | Sat | bdl | 0.005 | bdl | 144 | bdl |
| 176.5 | 8.4 | bdl | 36 | bdl | bdl | bdl | 459 | bdl |
| 80.7 | 1.1 | bdl | 33 | bdl | bdl | bdl | 306 | bdl |
| 79.8 | 1.1 | bdl | 15.9 | bdl | bdl | bdl | 639 | bdl |
| 68.2 | 1.1 | bdl | 15.0 | bdl | bdl | bdl | 660 | bdl |
| 55.2 | 1.0 | bdl | 15.5 | bdl | bdl | bdl | 634 | bdl |
| 52.4 | 0.9 | bdl | 15.8 | bdl | bdl | bdl | 660 | bdl |
| 49.4 | 0.8 | bdl | 14.7 | bdl | bdl | bdl | 651 | bdl |
| 40.6 | 0.5 | bdl | 17.7 | bdl | bdl | bdl | 627 | bdl |
| 32.6 | 0.6 | bdl | 15.3 | bdl | bdl | bdl | 585 | bdl |
| 43.4 | 1.4 | bdl | 13.8 | bdl | bdl | bdl | 548 | bdl |
| 15.6 | 0.2 | bdl | 0.0 | bdl | bdl | bdl | 298 | bdl |
| 31.0 | 0.4 | bdl | 15.9 | bdl | bdl | bdl | 591 | bdl |
| 31.8 | 0.3 | bdl | 15.7 | bdl | bdl | bdl | 575 | bdl |
| 38.6 | 0.3 | bdl | Sat | bdl | bdl | bdl | 262 | bdl |
| 34.1 | 0.2 | bdl | 28 | bdl | bdl | bdl | 234 | bdl |
| 31.6 | 0.2 | bdl | 29 | bdl | bdl | bdl | 233 | bdl |
| 28.9 | 0.2 | bdl | 28 | bdl | bdl | bdl | 232 | bdl |
| 31.6 | 0.2 | bdl | 17.1 | bdl | bdl | bdl | 509 | bdl |
| 30.4 | 0.2 | bdl | 18.7 | bdl | bdl | bdl | 419 | bdl |
| 25.0 | 0.1 | bdl | 13.9 | bdl | bdl | bdl | 457 | bdl |
| 23.3 | 0.1 | bdl | 13.8 | bdl | bdl | bdl | 370 | bdl |
| 22.5 | 0.1 | bdl | 11.6 | bdl | bdl | bdl | 254 | bdl |
| 24.1 | 0.1 | bdl | 12.0 | bdl | bdl | bdl | 170 | bdl |
| 27.2 | 0.1 | bdl | 12.4 | bdl | bdl | bdl | 123 | bdl |
| 29.3 | 0.1 | bdl | 11.6 | bdl | bdl | bdl | 103 | bdl |
| 29.3 | 0.1 | bdl | 47.1 | bdl | bdl | bdl | 70 | bdl |
| 30.4 | 0.0 | bdl | 49.0 | bdl | bdl | bdl | 50 | bdl |
| 34.2 | 0.0 | bdl | 53.5 | bdl | bdl | bdl | 41 | bdl |
| 34.7 | 0.0 | bdl | 47.9 | bdl | bdl | bdl | 45 | bdl |
| 37.0 | 0.0 | bdl | 46.7 | bdl | bdl | bdl | 52 | bdl |
| 41.5 | 0.0 | bdl | 50.9 | bdl | bdl | bdl | 53 | bdl |
| 44.6 | 0.0 | bdl | 50.7 | bdl | bdl | bdl | 66 | bdl |
| 54.0 | 0.1 | bdl | Sat | bdl | bdl | bdl | 68 | bdl |
| 50.0 | 0.0 | bdl | 57.2 | bdl | bdl | bdl | 78 | bdl |
| 36.1 | 0.0 | bdl | 45.6 | bdl | bdl | bdl | 37 | bdl |
| 36.2 | 0.1 | bdl | Sat | bdl | bdl | bdl | 34 | bdl |
| 44.7 | 0.1 | bdl | Sat | bdl | bdl | bdl | 22 | bdl |
| 33.2 | 0.0 | bdl | Sat | bdl | bdl | bdl | 33 | bdl |
| 33.8 | 0.1 | bdl | Sat | bdl | bdl | bdl | 31 | bdl |
| 32.3 | 0.1 | bdl | 50.0 | bdl | bdl | bdl | 31 | bdl |
| 31.1 | 0.1 | bdl | 46.2 | bdl | bdl | bdl | 30 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.02 | 2.5 | 0.25 | bdl | bdl | 0.007 | 0.69 |
| 0.02 | 2.5 | 0.25 | bdl | bdl | 0.008 | 0.64 |
| 0.02 | 2.3 | 0.23 | bdl | bdl | 0.005 | 0.60 |
| 0.03 | 2.3 | 0.30 | bdl | bdl | 0.004 | 0.83 |
| 0.01 | 2.3 | 0.28 | bdl | bdl | 0.009 | 0.70 |
| 0.02 | 1.7 | 0.21 | bdl | bdl | 0.000 | 0.49 |
| 0.02 | 1.8 | 0.20 | bdl | bdl | 0.001 | 0.46 |
| 0.02 | 1.6 | 0.20 | bdl | bdl | bdl | 0.46 |
| 0.02 | 1.7 | 0.21 | bdl | bdl | 0.001 | 0.45 |
| 0.02 | 1.9 | 0.21 | bdl | bdl | 0.006 | 0.44 |
| 0.01 | 1.8 | 0.20 | bdl | bdl | 0.006 | 0.41 |
| 0.02 | 1.7 | 0.19 | bdl | bdl | 0.005 | 0.38 |
| 0.02 | 1.6 | 0.18 | bdl | bdl | 0.002 | 0.34 |
| bdl | 7.6 | 0.89 | bdl | bdl | bdl | 0.57 |
| 0.07 | 9.0 | 0.71 | bdl | bdl | bdl | 0.06 |
| 0.11 | 15.0 | 0.56 | bdl | bdl | bdl | 0.03 |
| 0.07 | 16.3 | 0.49 | bdl | bdl | bdl | 0.03 |
| 0.09 | 16.3 | 0.46 | bdl | bdl | bdl | 0.03 |
| 0.12 | 16.7 | 0.48 | bdl | bdl | bdl | 0.03 |
| 0.10 | 16.1 | 0.46 | bdl | bdl | bdl | 0.02 |
| 0.09 | 8.2 | 0.48 | bdl | bdl | bdl | 0.02 |
| 0.07 | 7.1 | 0.41 | bdl | bdl | bdl | 0.05 |
| 0.08 | 8.2 | 0.42 | bdl | bdl | bdl | 0.13 |
| 0.03 | 3.6 | 0.21 | bdl | bdl | bdl | 0.01 |
| 0.09 | 6.6 | 0.38 | bdl | bdl | bdl | 0.02 |
| 0.11 | 6.5 | 0.37 | bdl | bdl | bdl | 0.03 |
| 0.07 | 3.8 | 0.49 | bdl | bdl | bdl | 0.02 |
| 0.07 | 3.0 | 0.44 | bdl | bdl | bdl | 0.08 |
| 0.06 | 3.4 | 0.44 | bdl | bdl | bdl | 0.02 |
| 0.08 | 3.4 | 0.44 | bdl | bdl | bdl | 0.02 |
| 0.13 | 4.1 | 0.70 | bdl | bdl | bdl | 0.04 |
| 0.13 | 4.1 | 0.77 | bdl | bdl | bdl | 0.01 |
| 0.19 | 3.9 | 0.60 | bdl | bdl | bdl | 0.03 |
| 0.14 | 3.4 | 0.51 | bdl | bdl | bdl | 0.00 |
| 0.12 | 3.2 | 0.37 | bdl | bdl | bdl | 0.00 |
| 0.12 | 3.1 | 0.31 | bdl | bdl | bdl | 0.01 |
| 0.11 | 2.9 | 0.27 | bdl | bdl | bdl | 0.01 |
| 0.06 | 2.8 | 0.20 | bdl | bdl | bdl | 0.03 |
| 0.03 | 2.8 | 0.09 | bdl | bdl | 0.002 | 0.03 |
| 0.03 | 2.6 | 0.08 | bdl | bdl | 0.002 | 0.01 |
| 0.02 | 2.4 | 0.07 | bdl | bdl | 0.002 | 0.01 |
| 0.02 | 2.4 | 0.06 | bdl | bdl | 0.001 | 0.04 |
| 0.02 | 2.2 | 0.05 | bdl | bdl | 0.003 | 0.01 |
| 0.03 | 2.3 | 0.05 | bdl | bdl | 0.004 | 0.01 |
| 0.02 | 2.3 | 0.05 | bdl | bdl | 0.003 | 0.01 |
| 0.02 | 2.7 | 0.06 | bdl | bdl | 0.011 | 0.04 |
| 0.02 | 2.4 | 0.05 | bdl | bdl | 0.009 | 0.01 |
| 0.01 | 2.0 | 0.03 | bdl | bdl | 0.003 | bdl |
| 0.01 | 2.1 | 0.03 | bdl | bdl | 0.001 | bdl |
| 0.01 | 2.1 | 0.04 | bdl | bdl | bdl | bdl |
| 0.01 | 2.2 | 0.03 | bdl | bdl | 0.007 | bdl |
| 0.01 | 2.0 | 0.03 | bdl | bdl | 0.007 | bdl |
| 0.01 | 1.9 | 0.03 | bdl | bdl | 0.003 | 0.01 |
| 0.01 | 1.9 | 0.03 | bdl | bdl | 0.002 | bdl |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Pyrite Isolate | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 3 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 5 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 13 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 14 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 15 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 18 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 22 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 23 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 24 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 27 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Isolate | 29 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 30 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 31 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 32 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 33 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Pyrite Isolate | 34 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 35 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 36 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Pyrite Isolate | 37 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Pyrite Isolate | 38 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Pyrite Isolate | 39 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Pyrite Isolate | 40 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 41 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 42 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 43 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 44 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 45 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 46 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7 Pyrite Isolate | 47 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 48 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Isolate | 49 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 3 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 5 | bdl | bdl | bdl | bdl | bdl |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.09 | 532 | 0.05 | bdl | bdl | bdl | 235.42 | Sat | 0.02 |
| 0.09 | 566 | 0.00 | bdl | bdl | 0.012 | 20.98 | 75 | 0.01 |
| 0.05 | 527 | bdl | bdl | bdl | 0.094 | 28.71 | 39 | 0.02 |
| 0.05 | 530 | bdl | bdl | bdl | 0.094 | 27.16 | 37 | 0.02 |
| 0.05 | 529 | bdl | bdl | bdl | 0.094 | 18.02 | 38 | 0.02 |
| 0.05 | 551 | bdl | bdl | bdl | 0.097 | 12.06 | 35 | 0.02 |
| 0.05 | 537 | bdl | bdl | bdl | 0.095 | 8.95 | 31 | 0.02 |
| 0.06 | 598 | bdl | bdl | bdl | 0.095 | 7.28 | 35 | 0.02 |
| 0.06 | 558 | bdl | bdl | bdl | 0.094 | 5.52 | 28 | 0.02 |
| 0.05 | 549 | bdl | bdl | bdl | 0.092 | 4.76 | 26 | 0.02 |
| 0.05 | 549 | bdl | bdl | bdl | 0.095 | 3.98 | 25 | 0.02 |
| 0.05 | 539 | bdl | bdl | bdl | 0.094 | 3.36 | 23 | 0.02 |
| 0.05 | 533 | bdl | bdl | bdl | 0.096 | 2.93 | 22 | 0.02 |
| 0.08 | 566 | bdl | bdl | bdl | 0.011 | 2.54 | 47 | 0.01 |
| 0.08 | 485 | bdl | bdl | bdl | 0.000 | 1.88 | 43 | 0.01 |
| 0.09 | 471 | bdl | bdl | bdl | 0.002 | 1.79 | 40 | 0.01 |
| 0.10 | 463 | bdl | bdl | bdl | 0.001 | 1.57 | 40 | 0.01 |
| 0.17 | 466 | bdl | bdl | bdl | 0.004 | 1.41 | 52 | 0.01 |
| 0.19 | 442 | bdl | bdl | bdl | 0.004 | 1.24 | 47 | 0.01 |
| 0.19 | 427 | bdl | bdl | bdl | 0.005 | 1.11 | 45 | 0.01 |
| 0.21 | 408 | bdl | bdl | bdl | 0.005 | 1.01 | 48 | 0.01 |
| 0.23 | 393 | bdl | bdl | bdl | 0.005 | 0.92 | 45 | 0.01 |
| 0.22 | 376 | bdl | bdl | bdl | 0.005 | 0.84 | 39 | 0.01 |
| 0.24 | 360 | bdl | bdl | bdl | 0.004 | 0.77 | 37 | 0.01 |
| 0.26 | 342 | bdl | bdl | bdl | 0.004 | 0.73 | 35 | 0.01 |
| 0.27 | 332 | bdl | bdl | bdl | 0.003 | 0.63 | 34 | 0.01 |
| 0.29 | 318 | bdl | bdl | bdl | 0.003 | 0.57 | 33 | 0.01 |
| 0.29 | 308 | bdl | bdl | bdl | 0.004 | 0.42 | 33 | 0.01 |
| bdl | 271 | bdl | bdl | bdl | 0.002 | 0.37 | 17 | bdl |
| bdl | 266 | bdl | bdl | bdl | 0.002 | 0.35 | 17 | bdl |
| bdl | 253 | bdl | bdl | bdl | 0.002 | 0.30 | 17 | bdl |
| bdl | 241 | bdl | bdl | bdl | 0.002 | 0.27 | 16 | bdl |
| bdl | 241 | bdl | bdl | bdl | 0.002 | 0.22 | 16 | bdl |
| bdl | 230 | bdl | bdl | bdl | 0.003 | 0.20 | 16 | bdl |
| bdl | 111 | bdl | bdl | bdl | 0.003 | 0.02 | 14 | bdl |
| bdl | 216 | bdl | bdl | bdl | 0.003 | 0.15 | 16 | bdl |
| bdl | 189 | bdl | bdl | bdl | 0.004 | 0.13 | 18 | bdl |
| bdl | 153 | bdl | bdl | bdl | 0.003 | 0.05 | 17 | bdl |
| bdl | 92 | bdl | bdl | bdl | 0.002 | 0.03 | 17 | bdl |
| bdl | 42 | bdl | bdl | bdl | 0.002 | bdl | 15 | bdl |
| bdl | 43 | bdl | bdl | bdl | 0.002 | 0.02 | 16 | bdl |
| bdl | 40 | bdl | bdl | bdl | 0.000 | 0.01 | 15 | bdl |
| bdl | 37 | bdl | bdl | bdl | bdl | bdl | 14 | bdl |
| bdl | 39 | bdl | bdl | bdl | 0.000 | bdl | 15 | bdl |
| bdl | 39 | bdl | bdl | bdl | bdl | bdl | 19 | bdl |
| bdl | 41 | bdl | bdl | bdl | 0.002 | 0.01 | 21 | bdl |
| bdl | 36 | bdl | bdl | bdl | 0.001 | bdl | 18 | bdl |
| bdl | 35 | bdl | bdl | bdl | 0.000 | bdl | 15 | bdl |
| bdl | 35 | bdl | bdl | bdl | 0.000 | bdl | 14 | bdl |
| 0.08 | 385 | 0.00 | bdl | bdl | 0.008 | 16.25 | Sat | 0.01 |
| 0.07 | 429 | 0.00 | bdl | bdl | 0.011 | 22.00 | Sat | 0.01 |
| 0.04 | 375 | bdl | bdl | bdl | 0.095 | 16.30 | 31 | 0.02 |
| 0.04 | 356 | bdl | bdl | bdl | 0.096 | 12.25 | 30 | 0.02 |
| 0.04 | 331 | bdl | bdl | bdl | 0.097 | 7.51 | 31 | 0.02 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 153.4 | 6.9 | bdl | Sat | bdl | bdl | bdl | 441 | bdl |
| 49.3 | 1.0 | bdl | 38 | bdl | bdl | bdl | 286 | bdl |
| 67.9 | 1.8 | bdl | 24.5 | bdl | bdl | bdl | 658 | bdl |
| 85.4 | 2.3 | bdl | 24.6 | bdl | bdl | bdl | 695 | bdl |
| 85.7 | 1.9 | bdl | 25.5 | bdl | bdl | bdl | 688 | bdl |
| 72.6 | 1.5 | bdl | 21.8 | bdl | bdl | bdl | 684 | bdl |
| 54.2 | 1.1 | bdl | 17.9 | bdl | bdl | bdl | 628 | bdl |
| 50.4 | 1.3 | bdl | 17.7 | bdl | bdl | bdl | 638 | bdl |
| 37.6 | 0.9 | bdl | 15.9 | bdl | bdl | bdl | 628 | bdl |
| 37.1 | 0.8 | bdl | 14.9 | bdl | bdl | bdl | 619 | bdl |
| 37.5 | 0.7 | bdl | 15.6 | bdl | bdl | bdl | 623 | bdl |
| 37.1 | 0.6 | bdl | 15.3 | bdl | bdl | bdl | 614 | bdl |
| 37.1 | 0.5 | bdl | 15.7 | bdl | bdl | bdl | 601 | bdl |
| 40.5 | 0.5 | bdl | Sat | bdl | bdl | bdl | 277 | bdl |
| 36.9 | 0.4 | bdl | 29 | bdl | bdl | bdl | 236 | bdl |
| 36.4 | 0.4 | bdl | 30 | bdl | bdl | bdl | 227 | bdl |
| 38.3 | 0.4 | bdl | 30 | bdl | bdl | bdl | 223 | bdl |
| 40.6 | 0.3 | bdl | 16.1 | bdl | bdl | bdl | 470 | bdl |
| 41.7 | 0.3 | bdl | 14.3 | bdl | bdl | bdl | 446 | bdl |
| 40.9 | 0.3 | bdl | 13.9 | bdl | bdl | bdl | 428 | bdl |
| 40.5 | 0.3 | bdl | 15.5 | bdl | bdl | bdl | 408 | bdl |
| 41.4 | 0.3 | bdl | 14.6 | bdl | bdl | bdl | 392 | bdl |
| 41.4 | 0.3 | bdl | 12.9 | bdl | bdl | bdl | 373 | bdl |
| 39.6 | 0.2 | bdl | 12.5 | bdl | bdl | bdl | 353 | bdl |
| 37.2 | 0.2 | bdl | 12.3 | bdl | bdl | bdl | 333 | bdl |
| 35.6 | 0.2 | bdl | 12.3 | bdl | bdl | bdl | 323 | bdl |
| 34.9 | 0.2 | bdl | 12.3 | bdl | bdl | bdl | 302 | bdl |
| 37.6 | 0.2 | bdl | 12.5 | bdl | bdl | bdl | 300 | bdl |
| 39.0 | 0.2 | bdl | 53.4 | bdl | bdl | bdl | 233 | bdl |
| 39.6 | 0.2 | bdl | 53.7 | bdl | bdl | bdl | 228 | bdl |
| 39.4 | 0.2 | bdl | 53.1 | bdl | bdl | bdl | 219 | bdl |
| 39.2 | 0.2 | bdl | 52.2 | bdl | bdl | bdl | 208 | bdl |
| 39.7 | 0.2 | bdl | 52.9 | bdl | bdl | bdl | 206 | bdl |
| 40.1 | 0.2 | bdl | 52.3 | bdl | bdl | bdl | 198 | bdl |
| 21.3 | 0.1 | bdl | 51.9 | bdl | bdl | bdl | 75 | bdl |
| 41.6 | 0.1 | bdl | 56.2 | bdl | bdl | bdl | 186 | bdl |
| 42.6 | 0.1 | bdl | 59.6 | bdl | 0.006 | bdl | 162 | bdl |
| 40.7 | 0.1 | bdl | 56.9 | bdl | 0.006 | bdl | 130 | bdl |
| 40.7 | 0.1 | bdl | 53.1 | bdl | 0.006 | bdl | 82 | bdl |
| 43.9 | 0.1 | bdl | 52.7 | bdl | 0.011 | bdl | 50 | bdl |
| 47.0 | 0.1 | bdl | 53.0 | bdl | 0.003 | bdl | 57 | bdl |
| 44.4 | 0.1 | bdl | 48.1 | bdl | 0.003 | bdl | 53 | bdl |
| 41.9 | 0.1 | bdl | 44.6 | bdl | 0.006 | bdl | 48 | bdl |
| 44.9 | 0.1 | bdl | Sat | bdl | 0.005 | bdl | 50 | bdl |
| 47.3 | 0.1 | bdl | Sat | bdl | 0.004 | bdl | 47 | bdl |
| 50.2 | 0.1 | bdl | Sat | bdl | 0.011 | bdl | 51 | bdl |
| 44.5 | 0.1 | bdl | Sat | bdl | 0.008 | bdl | 48 | bdl |
| 41.5 | 0.1 | bdl | Sat | bdl | 0.006 | bdl | 44 | bdl |
| 41.0 | 0.1 | bdl | 61.5 | bdl | 0.003 | bdl | 43 | bdl |
| 95.7 | 1.0 | bdl | Sat | bdl | bdl | bdl | 269 | bdl |
| 104.6 | 1.1 | bdl | 37 | bdl | bdl | bdl | 272 | bdl |
| 85.5 | 1.0 | bdl | 16.1 | bdl | bdl | bdl | 536 | bdl |
| 85.2 | 1.1 | bdl | 15.6 | bdl | bdl | bdl | 527 | bdl |
| 81.4 | 1.1 | bdl | 17.0 | bdl | bdl | bdl | 486 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| bdl | 9.7 | 0.84 | bdl | bdl | bdl | 0.30 |
| 0.07 | 9.3 | 0.61 | bdl | bdl | bdl | 0.06 |
| 0.11 | 17.2 | 0.49 | bdl | bdl | bdl | 0.05 |
| 0.08 | 18.1 | 0.54 | bdl | bdl | bdl | 0.05 |
| 0.05 | 18.0 | 0.54 | bdl | bdl | bdl | 0.04 |
| 0.09 | 18.7 | 0.53 | bdl | bdl | bdl | 0.03 |
| 0.07 | 18.0 | 0.49 | bdl | bdl | bdl | 0.02 |
| 0.08 | 14.1 | 0.52 | bdl | bdl | bdl | 0.03 |
| 0.09 | 13.7 | 0.47 | bdl | bdl | bdl | 0.02 |
| 0.10 | 13.8 | 0.45 | bdl | bdl | bdl | 0.02 |
| 0.11 | 13.8 | 0.45 | bdl | bdl | bdl | 0.02 |
| 0.10 | 13.4 | 0.44 | bdl | bdl | bdl | 0.02 |
| 0.08 | 12.8 | 0.43 | bdl | bdl | bdl | 0.02 |
| 0.09 | 5.7 | 0.54 | bdl | bdl | bdl | 0.02 |
| 0.09 | 5.0 | 0.49 | bdl | bdl | bdl | 0.01 |
| 0.07 | 5.1 | 0.47 | bdl | bdl | bdl | 0.01 |
| 0.08 | 5.0 | 0.46 | bdl | bdl | bdl | 0.01 |
| 0.20 | 5.2 | 0.64 | bdl | bdl | bdl | 0.01 |
| 0.19 | 5.1 | 0.60 | bdl | bdl | bdl | 0.01 |
| 0.15 | 4.8 | 0.55 | bdl | bdl | bdl | 0.01 |
| 0.16 | 4.6 | 0.53 | bdl | bdl | bdl | 0.01 |
| 0.14 | 4.6 | 0.52 | bdl | bdl | bdl | 0.00 |
| 0.13 | 4.4 | 0.46 | bdl | bdl | bdl | 0.00 |
| 0.14 | 4.2 | 0.44 | bdl | bdl | bdl | 0.00 |
| 0.14 | 4.0 | 0.42 | bdl | bdl | bdl | 0.02 |
| 0.08 | 3.7 | 0.41 | bdl | bdl | bdl | 0.01 |
| 0.18 | 3.5 | 0.40 | bdl | bdl | bdl | 0.00 |
| 0.16 | 3.6 | 0.38 | bdl | bdl | bdl | 0.01 |
| 0.04 | 3.6 | 0.21 | bdl | bdl | 0.001 | 0.01 |
| 0.05 | 3.5 | 0.20 | bdl | bdl | 0.001 | 0.01 |
| 0.04 | 3.4 | 0.19 | bdl | bdl | 0.001 | 0.01 |
| 0.03 | 3.3 | 0.18 | bdl | bdl | 0.001 | 0.01 |
| 0.05 | 3.2 | 0.18 | bdl | bdl | 0.002 | 0.01 |
| 0.03 | 3.2 | 0.17 | bdl | bdl | 0.003 | 0.01 |
| 0.03 | 2.5 | 0.09 | bdl | bdl | 0.006 | 0.01 |
| 0.05 | 3.1 | 0.15 | bdl | bdl | 0.005 | 0.01 |
| 0.03 | 3.5 | 0.14 | bdl | bdl | 0.010 | 0.00 |
| 0.03 | 3.3 | 0.11 | bdl | bdl | 0.009 | bdl |
| 0.03 | 3.2 | 0.08 | bdl | bdl | 0.007 | bdl |
| 0.03 | 2.7 | 0.05 | bdl | bdl | 0.007 | bdl |
| 0.03 | 2.8 | 0.05 | bdl | bdl | 0.006 | bdl |
| 0.02 | 2.5 | 0.05 | bdl | bdl | 0.001 | bdl |
| 0.02 | 2.3 | 0.04 | bdl | bdl | bdl | bdl |
| 0.02 | 2.5 | 0.04 | bdl | bdl | 0.002 | bdl |
| 0.02 | 2.4 | 0.05 | bdl | bdl | bdl | bdl |
| 0.02 | 2.7 | 0.05 | bdl | bdl | 0.008 | bdl |
| 0.02 | 2.6 | 0.04 | bdl | bdl | 0.008 | bdl |
| 0.01 | 2.4 | 0.04 | bdl | bdl | 0.003 | bdl |
| 0.02 | 2.3 | 0.04 | bdl | bdl | 0.002 | bdl |
| 0.06 | 6.6 | 0.59 | bdl | bdl | bdl | 0.02 |
| 0.07 | 7.2 | 0.66 | bdl | bdl | bdl | 0.02 |
| 0.10 | 11.7 | 0.43 | bdl | bdl | bdl | 0.02 |
| 0.06 | 10.9 | 0.42 | bdl | bdl | bdl | 0.02 |
| 0.06 | 9.7 | 0.38 | bdl | bdl | bdl | 0.01 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7 Pyrite Sterile | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 10 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 11 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 13 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 14 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 18 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 22 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 23 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 24 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 27 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7 Pyrite Sterile | 29 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 30 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 31 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 32 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 33 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 34 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 36 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 37 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 38 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 39 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 40 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 41 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 42 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 43 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 44 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 45 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 46 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 47 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 48 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7 Pyrite Sterile | 49 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7Pyrite S-oxidizer | 1 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 2 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 3 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 4 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 5 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 6 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 7 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 8 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 9 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 12 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 13 | bdl | bdl | bdl | bdl | bdl |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.04 | 356 | bdl | bdl | bdl | 0.098 | 4.61 | 31 | 0.02 |
| 0.04 | 319 | bdl | bdl | bdl | 0.096 | 3.10 | 23 | 0.02 |
| 0.05 | 273 | bdl | bdl | bdl | 0.097 | 3.35 | 20 | 0.01 |
| 0.06 | 213 | bdl | bdl | bdl | 0.094 | 1.69 | 17 | 0.01 |
| 0.06 | 259 | bdl | bdl | bdl | 0.091 | 2.07 | 17 | 0.01 |
| 0.06 | 264 | bdl | bdl | bdl | 0.091 | 1.94 | 18 | 0.01 |
| 0.06 | 251 | bdl | bdl | bdl | 0.093 | 1.57 | 18 | 0.01 |
| 0.06 | 254 | bdl | bdl | bdl | 0.095 | 1.64 | 17 | 0.01 |
| 0.09 | 280 | bdl | bdl | bdl | 0.010 | 1.87 | 37 | 0.01 |
| 0.09 | 247 | bdl | bdl | bdl | bdl | 1.02 | 36 | 0.00 |
| 0.09 | 202 | bdl | bdl | bdl | 0.000 | 0.81 | 30 | 0.00 |
| 0.10 | 201 | bdl | bdl | bdl | 0.000 | 0.78 | 29 | 0.00 |
| 0.15 | 211 | bdl | bdl | bdl | 0.002 | 0.74 | 43 | 0.01 |
| 0.16 | 197 | bdl | bdl | bdl | 0.003 | 0.55 | 41 | 0.01 |
| 0.15 | 194 | bdl | bdl | bdl | 0.004 | 0.50 | 36 | 0.01 |
| 0.16 | 189 | bdl | bdl | bdl | 0.002 | 0.41 | 39 | 0.01 |
| 0.17 | 178 | bdl | bdl | bdl | 0.004 | 0.38 | 37 | 0.01 |
| 0.16 | 168 | bdl | bdl | bdl | 0.003 | 0.24 | 31 | 0.01 |
| 0.17 | 163 | bdl | bdl | bdl | 0.002 | 0.22 | 31 | 0.01 |
| 0.17 | 159 | bdl | bdl | bdl | 0.003 | 0.19 | 30 | 0.01 |
| 0.17 | 153 | bdl | bdl | bdl | 0.002 | 0.15 | 30 | 0.01 |
| 0.18 | 146 | bdl | bdl | bdl | 0.003 | 0.12 | 29 | 0.01 |
| 0.18 | 149 | bdl | bdl | bdl | 0.003 | 0.07 | 30 | 0.01 |
| bdl | 143 | bdl | bdl | bdl | 0.001 | 0.07 | 15 | bdl |
| bdl | 135 | bdl | bdl | bdl | 0.001 | 0.05 | 15 | bdl |
| bdl | 126 | bdl | bdl | bdl | 0.001 | 0.04 | 14 | bdl |
| bdl | 118 | bdl | bdl | bdl | 0.001 | 0.03 | 14 | bdl |
| bdl | 126 | bdl | bdl | bdl | 0.001 | 0.05 | 15 | bdl |
| bdl | 107 | bdl | bdl | bdl | 0.002 | 0.03 | 14 | bdl |
| bdl | 104 | bdl | bdl | bdl | 0.002 | 0.01 | 14 | bdl |
| bdl | 106 | bdl | bdl | bdl | 0.002 | 0.03 | 17 | bdl |
| bdl | 101 | bdl | bdl | bdl | 0.002 | 0.01 | 16 | bdl |
| bdl | 97 | bdl | bdl | bdl | 0.001 | 0.01 | 16 | bdl |
| bdl | 103 | bdl | bdl | bdl | 0.002 | 0.12 | 20 | bdl |
| bdl | 96 | bdl | bdl | bdl | 0.000 | 0.06 | 20 | bdl |
| bdl | 81 | bdl | bdl | bdl | bdl | 0.05 | 19 | bdl |
| bdl | 70 | bdl | bdl | bdl | bdl | 0.04 | 16 | bdl |
| bdl | 76 | bdl | bdl | bdl | bdl | 0.01 | 19 | bdl |
| bdl | 69 | bdl | bdl | bdl | bdl | 0.02 | 21 | bdl |
| bdl | 76 | bdl | bdl | bdl | 0.001 | 0.05 | 23 | bdl |
| bdl | 73 | bdl | bdl | bdl | 0.001 | 0.03 | 20 | bdl |
| bdl | 67 | bdl | bdl | bdl | bdl | 0.03 | 18 | bdl |
| bdl | 65 | bdl | bdl | bdl | bdl | 0.01 | 16 | bdl |
| 0.13 | 476 | 0.10 | bdl | bdl | bdl | 411.86 | Sat | 0.02 |
| 0.03 | 522 | 0.04 | bdl | bdl | bdl | 209.12 | Sat | 0.02 |
| 0.02 | 515 | bdl | bdl | bdl | 0.084 | 135.17 | 55 | 0.03 |
| 0.05 | 524 | bdl | bdl | bdl | 0.092 | 44.57 | 42 | 0.03 |
| 0.06 | 517 | bdl | bdl | bdl | 0.092 | 31.17 | 40 | 0.02 |
| 0.06 | 533 | bdl | bdl | bdl | 0.094 | 24.30 | 39 | 0.02 |
| 0.06 | 523 | bdl | bdl | bdl | 0.094 | 17.60 | 37 | 0.02 |
| 0.05 | 489 | bdl | bdl | bdl | 0.166 | 5.77 | 31 | 0.02 |
| 0.06 | 415 | bdl | bdl | bdl | 0.104 | 0.15 | 23 | 0.02 |
| 0.07 | 499 | bdl | bdl | bdl | 0.169 | 7.27 | 26 | 0.02 |
| 0.06 | 437 | bdl | bdl | bdl | 0.135 | 0.74 | 24 | 0.02 |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 80.2 | 1.0 | bdl | 17.3 | bdl | bdl | bdl | 507 | bdl |
| 49.4 | 0.8 | bdl | 14.3 | bdl | bdl | bdl | 414 | bdl |
| 33.5 | 0.6 | bdl | 14.4 | bdl | bdl | bdl | 332 | bdl |
| 25.5 | 0.5 | bdl | 14.4 | bdl | bdl | bdl | 235 | bdl |
| 28.5 | 0.5 | bdl | 13.1 | bdl | bdl | bdl | 297 | bdl |
| 26.8 | 0.5 | bdl | 13.7 | bdl | bdl | bdl | 296 | bdl |
| 25.4 | 0.5 | bdl | 14.7 | bdl | bdl | bdl | 282 | bdl |
| 24.6 | 0.5 | bdl | 14.4 | bdl | bdl | bdl | 278 | bdl |
| 26.7 | 0.4 | bdl | 28 | bdl | bdl | bdl | 129 | bdl |
| 24.7 | 0.3 | bdl | 27 | bdl | bdl | bdl | 111 | bdl |
| 20.6 | 0.3 | bdl | 26 | bdl | bdl | bdl | 94 | bdl |
| 20.4 | 0.3 | bdl | 25 | bdl | bdl | bdl | 97 | bdl |
| 21.6 | 0.3 | bdl | 14.5 | bdl | bdl | bdl | 194 | bdl |
| 21.4 | 0.3 | bdl | 13.8 | bdl | bdl | bdl | 179 | bdl |
| 21.2 | 0.3 | bdl | 12.2 | bdl | bdl | bdl | 178 | bdl |
| 20.7 | 0.3 | bdl | 13.8 | bdl | bdl | bdl | 169 | bdl |
| 20.3 | 0.3 | bdl | 14.4 | bdl | bdl | bdl | 157 | bdl |
| 19.5 | 0.2 | bdl | 11.5 | bdl | bdl | bdl | 145 | bdl |
| 20.6 | 0.2 | bdl | 11.4 | bdl | bdl | bdl | 141 | bdl |
| 19.9 | 0.2 | bdl | 11.2 | bdl | bdl | bdl | 139 | bdl |
| 18.9 | 0.2 | bdl | 11.3 | bdl | bdl | bdl | 131 | bdl |
| 18.9 | 0.2 | bdl | 11.1 | bdl | bdl | bdl | 124 | bdl |
| 19.9 | 0.2 | bdl | 11.2 | bdl | bdl | bdl | 130 | bdl |
| 20.3 | 0.2 | bdl | 48.1 | bdl | bdl | bdl | 110 | bdl |
| 20.1 | 0.2 | bdl | 48.1 | bdl | bdl | bdl | 102 | bdl |
| 19.8 | 0.2 | bdl | 46.7 | bdl | bdl | bdl | 95 | bdl |
| 19.4 | 0.2 | bdl | 46.7 | bdl | bdl | bdl | 86 | bdl |
| 20.5 | 0.2 | bdl | 50.0 | bdl | bdl | bdl | 91 | bdl |
| 19.5 | 0.1 | bdl | 48.9 | bdl | bdl | bdl | 73 | bdl |
| 20.6 | 0.1 | bdl | 51.5 | bdl | bdl | bdl | 72 | bdl |
| 22.2 | 0.1 | bdl | 57.8 | bdl | 0.004 | bdl | 72 | bdl |
| 21.9 | 0.1 | bdl | 53.9 | bdl | 0.010 | bdl | 69 | bdl |
| 21.4 | 0.1 | bdl | 52.8 | bdl | 0.010 | bdl | 65 | bdl |
| 28.5 | 0.2 | bdl | Sat | bdl | 0.007 | bdl | 69 | bdl |
| 26.0 | 0.2 | bdl | 54.0 | bdl | 0.003 | bdl | 66 | bdl |
| 23.1 | 0.1 | bdl | 50.9 | bdl | 0.004 | bdl | 55 | bdl |
| 21.5 | 0.1 | bdl | 43.9 | bdl | 0.008 | bdl | 50 | bdl |
| 24.9 | 0.1 | bdl | Sat | bdl | 0.009 | bdl | 52 | bdl |
| 25.0 | 0.1 | bdl | Sat | bdl | 0.002 | bdl | 46 | bdl |
| 27.0 | 0.1 | bdl | Sat | bdl | 0.007 | bdl | 58 | bdl |
| 25.5 | 0.1 | bdl | Sat | bdl | 0.003 | bdl | 53 | bdl |
| 23.8 | 0.1 | bdl | Sat | bdl | 0.009 | bdl | 49 | bdl |
| 22.7 | 0.1 | bdl | Sat | bdl | 0.007 | bdl | 44 | bdl |
| 153.1 | 9.8 | bdl | Sat | bdl | bdl | bdl | 488 | bdl |
| 97.3 | 5.7 | bdl | Sat | bdl | bdl | bdl | 389 | bdl |
| 68.4 | 3.7 | bdl | 17.1 | bdl | bdl | bdl | 740 | bdl |
| 48.6 | 1.5 | bdl | 15.2 | bdl | bdl | bdl | 661 | bdl |
| 41.6 | 1.0 | bdl | 16.3 | bdl | bdl | bdl | 627 | bdl |
| 41.0 | 0.9 | bdl | 16.5 | bdl | bdl | bdl | 637 | bdl |
| 39.9 | 0.8 | bdl | 15.8 | bdl | bdl | bdl | 620 | bdl |
| 33.2 | 0.9 | bdl | 16.3 | bdl | bdl | bdl | 630 | bdl |
| 35.2 | 0.7 | bdl | 14.3 | bdl | bdl | bdl | 499 | bdl |
| 35.1 | 0.8 | bdl | 15.5 | bdl | bdl | bdl | 593 | bdl |
| 34.9 | 0.6 | bdl | 15.6 | bdl | bdl | bdl | 502 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.07 | 9.5 | 0.40 | bdl | bdl | bdl | 0.01 |
| 0.06 | 8.6 | 0.32 | bdl | bdl | bdl | 0.01 |
| 0.06 | 7.4 | 0.24 | bdl | bdl | bdl | 0.01 |
| 0.05 | 6.8 | 0.19 | bdl | bdl | bdl | 0.01 |
| 0.07 | 7.6 | 0.22 | bdl | bdl | bdl | 0.01 |
| 0.09 | 8.0 | 0.22 | bdl | bdl | bdl | 0.01 |
| 0.06 | 8.0 | 0.21 | bdl | bdl | bdl | 0.01 |
| 0.06 | 8.0 | 0.21 | bdl | bdl | bdl | 0.01 |
| 0.04 | 3.5 | 0.31 | bdl | bdl | bdl | 0.01 |
| 0.07 | 2.9 | 0.28 | bdl | bdl | bdl | 0.01 |
| 0.05 | 3.3 | 0.22 | bdl | bdl | bdl | 0.01 |
| 0.03 | 3.3 | 0.21 | bdl | bdl | bdl | 0.01 |
| 0.12 | 3.5 | 0.31 | bdl | bdl | bdl | 0.00 |
| 0.10 | 3.5 | 0.30 | bdl | bdl | bdl | 0.00 |
| 0.10 | 3.4 | 0.27 | bdl | bdl | bdl | 0.01 |
| 0.07 | 3.2 | 0.27 | bdl | bdl | bdl | 0.00 |
| 0.09 | 3.1 | 0.25 | bdl | bdl | bdl | 0.01 |
| 0.12 | 2.9 | 0.21 | bdl | bdl | bdl | 0.00 |
| 0.09 | 3.0 | 0.22 | bdl | bdl | bdl | 0.00 |
| 0.08 | 2.8 | 0.21 | bdl | bdl | bdl | 0.00 |
| 0.08 | 2.6 | 0.20 | bdl | bdl | bdl | 0.01 |
| 0.07 | 2.6 | 0.20 | bdl | bdl | bdl | 0.00 |
| 0.08 | 2.6 | 0.20 | bdl | bdl | bdl | 0.00 |
| 0.04 | 2.6 | 0.11 | bdl | bdl | 0.002 | 0.01 |
| 0.03 | 2.5 | 0.11 | bdl | bdl | 0.002 | 0.01 |
| 0.03 | 2.5 | 0.10 | bdl | bdl | 0.001 | 0.01 |
| 0.02 | 2.4 | 0.09 | bdl | bdl | 0.002 | 0.01 |
| 0.02 | 2.4 | 0.10 | bdl | bdl | 0.002 | 0.01 |
| 0.04 | 2.4 | 0.09 | bdl | bdl | 0.003 | 0.01 |
| 0.02 | 2.3 | 0.08 | bdl | bdl | 0.005 | 0.01 |
| 0.03 | 2.6 | 0.09 | bdl | bdl | 0.009 | bdl |
| 0.01 | 2.5 | 0.09 | bdl | bdl | 0.009 | bdl |
| 0.02 | 2.5 | 0.08 | bdl | bdl | 0.007 | bdl |
| 0.02 | 3.2 | 0.10 | bdl | bdl | 0.007 | bdl |
| 0.02 | 2.7 | 0.09 | bdl | bdl | 0.003 | bdl |
| 0.02 | 2.6 | 0.08 | bdl | bdl | 0.001 | bdl |
| 0.02 | 2.2 | 0.07 | bdl | bdl | bdl | bdl |
| 0.02 | 2.4 | 0.08 | bdl | bdl | 0.002 | bdl |
| 0.02 | 2.3 | 0.07 | bdl | bdl | bdl | bdl |
| 0.03 | 2.7 | 0.08 | bdl | bdl | 0.007 | bdl |
| 0.02 | 2.6 | 0.08 | bdl | bdl | 0.007 | bdl |
| 0.02 | 2.3 | 0.07 | bdl | bdl | 0.002 | bdl |
| 0.02 | 2.3 | 0.07 | bdl | bdl | 0.002 | bdl |
| bdl | 6.2 | 1.00 | bdl | bdl | bdl | 0.76 |
| 0.00 | 5.4 | 0.96 | bdl | bdl | bdl | 0.32 |
| 0.04 | 9.7 | 0.65 | bdl | bdl | bdl | 0.19 |
| 0.09 | 10.6 | 0.53 | bdl | bdl | bdl | 0.09 |
| 0.11 | 11.1 | 0.50 | bdl | bdl | bdl | 0.08 |
| 0.07 | 11.0 | 0.50 | bdl | bdl | bdl | 0.06 |
| 0.09 | 10.7 | 0.48 | bdl | bdl | bdl | 0.05 |
| 0.09 | 6.8 | 0.45 | bdl | bdl | bdl | 0.13 |
| 0.07 | 4.8 | 0.40 | bdl | bdl | bdl | 0.06 |
| 0.07 | 6.6 | 0.53 | bdl | bdl | bdl | 0.05 |
| 0.08 | 5.4 | 0.44 | bdl | bdl | bdl | 0.06 |

| Experimental ID | Sample # | Ag (ppm) | Al (ppm) | As (ppm) | Au (ppm) | B (ppm) |
|---|---|---|---|---|---|---|
| Talbot/T7Pyrite S-oxidizer | 15 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 16 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 17 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 18 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 19 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 20 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 21 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 22 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 23 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 24 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 25 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 26 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 27 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 28 | bdl | bdl | bdl | bdl | bdl |
| Talbot/T7Pyrite S-oxidizer | 29 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 30 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 31 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 32 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 33 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 35 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 36 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 37 | bdl | bdl | bdl | bdl | 0.00 |
| Talbot/T7Pyrite S-oxidizer | 38 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 40 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 41 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 42 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 43 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 44 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 45 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 46 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 47 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 48 | bdl | bdl | bdl | bdl | 0.01 |
| Talbot/T7Pyrite S-oxidizer | 49 | bdl | bdl | bdl | bdl | 0.01 |

| Ba (ppm) | Ca (ppm) | Cd (ppm) | Co (ppm) | Cr (ppm) | Cu (ppm) | Fe (ppm) | K (ppm) | Li (ppm) |
|---|---|---|---|---|---|---|---|---|
| 0.08 | 380 | bdl | bdl | bdl | 0.008 | 0.92 | 38 | 0.01 |
| 0.09 | 376 | bdl | bdl | bdl | 0.012 | 0.19 | 44 | 0.01 |
| 0.04 | 148 | bdl | bdl | bdl | bdl | 0.01 | 22 | 0.00 |
| 0.12 | 323 | bdl | bdl | bdl | 0.013 | 0.01 | 55 | 0.01 |
| 0.11 | 314 | bdl | bdl | bdl | 0.012 | 0.23 | 48 | 0.01 |
| 0.10 | 312 | bdl | bdl | bdl | 0.010 | 0.01 | 46 | 0.01 |
| 0.10 | 301 | bdl | bdl | bdl | 0.010 | 0.01 | 48 | 0.01 |
| 0.10 | 307 | bdl | bdl | bdl | 0.011 | 0.01 | 47 | 0.01 |
| 0.10 | 303 | bdl | bdl | bdl | 0.008 | bdl | 41 | 0.01 |
| 0.09 | 296 | bdl | bdl | bdl | 0.008 | bdl | 40 | 0.01 |
| 0.09 | 301 | bdl | bdl | bdl | 0.008 | 0.01 | 40 | 0.01 |
| 0.09 | 291 | bdl | bdl | bdl | 0.008 | 0.01 | 39 | 0.01 |
| 0.09 | 287 | bdl | bdl | bdl | 0.006 | bdl | 37 | 0.01 |
| 0.10 | 287 | bdl | bdl | bdl | 0.006 | bdl | 38 | 0.01 |
| bdl | 263 | bdl | bdl | bdl | 0.005 | bdl | 20 | bdl |
| bdl | 256 | bdl | bdl | bdl | 0.005 | bdl | 20 | bdl |
| bdl | 253 | bdl | bdl | bdl | 0.005 | 0.00 | 20 | bdl |
| bdl | 254 | bdl | bdl | bdl | 0.005 | bdl | 19 | bdl |
| bdl | 257 | bdl | bdl | bdl | 0.005 | bdl | 20 | bdl |
| bdl | 244 | bdl | bdl | bdl | 0.003 | 0.20 | 16 | bdl |
| bdl | 408 | bdl | bdl | bdl | 0.277 | 0.19 | 26 | bdl |
| bdl | 364 | bdl | bdl | bdl | 0.098 | 0.78 | 26 | bdl |
| bdl | 346 | bdl | bdl | bdl | 0.051 | 0.43 | 25 | bdl |
| bdl | 166 | bdl | bdl | bdl | 0.007 | bdl | 20 | bdl |
| bdl | 178 | bdl | bdl | bdl | 0.008 | bdl | 22 | bdl |
| bdl | 142 | bdl | bdl | bdl | 0.005 | bdl | 18 | bdl |
| bdl | 127 | bdl | bdl | bdl | 0.004 | bdl | 17 | bdl |
| bdl | 112 | bdl | bdl | bdl | 0.006 | bdl | 19 | bdl |
| bdl | 75 | bdl | bdl | bdl | 0.004 | bdl | 17 | bdl |
| bdl | 74 | bdl | bdl | bdl | 0.006 | bdl | 19 | bdl |
| bdl | 65 | bdl | bdl | bdl | 0.006 | bdl | 19 | bdl |
| bdl | 61 | bdl | bdl | bdl | 0.004 | bdl | 17 | bdl |
| bdl | 56 | bdl | bdl | bdl | 0.003 | bdl | 16 | bdl |

| Mg (ppm) | Mn (ppm) | Mo (ppm) | Na (ppm) | Ni (ppm) | P (ppm) | Pb (ppm) | S (ppm) | Sb (ppm) |
|---|---|---|---|---|---|---|---|---|
| 29.2 | 0.4 | bdl | 24 | bdl | bdl | bdl | 227 | bdl |
| 33.3 | 0.4 | bdl | 29 | bdl | bdl | bdl | 182 | bdl |
| 17.6 | 0.2 | bdl | 16 | bdl | bdl | bdl | 81 | bdl |
| 37.4 | 0.4 | bdl | 15.7 | bdl | bdl | bdl | 362 | bdl |
| 36.0 | 0.3 | bdl | 13.9 | bdl | bdl | bdl | 346 | bdl |
| 34.0 | 0.3 | bdl | 13.5 | bdl | bdl | bdl | 337 | bdl |
| 32.7 | 0.3 | bdl | 14.4 | bdl | bdl | bdl | 323 | bdl |
| 32.9 | 0.3 | bdl | 14.3 | bdl | bdl | bdl | 327 | bdl |
| 32.1 | 0.3 | bdl | 12.4 | bdl | bdl | bdl | 320 | bdl |
| 30.8 | 0.3 | bdl | 12.2 | bdl | bdl | bdl | 313 | bdl |
| 30.9 | 0.3 | bdl | 12.1 | bdl | bdl | bdl | 315 | bdl |
| 30.1 | 0.2 | bdl | 12.1 | bdl | bdl | bdl | 305 | bdl |
| 28.7 | 0.2 | bdl | 11.8 | bdl | bdl | bdl | 298 | bdl |
| 31.9 | 0.2 | bdl | 11.8 | bdl | bdl | bdl | 303 | bdl |
| 32.3 | 0.2 | bdl | 52.6 | bdl | bdl | bdl | 239 | bdl |
| 32.3 | 0.2 | bdl | 52.2 | bdl | bdl | bdl | 235 | bdl |
| 32.3 | 0.2 | bdl | 52.1 | bdl | bdl | bdl | 229 | bdl |
| 32.7 | 0.2 | bdl | 52.1 | bdl | bdl | bdl | 227 | bdl |
| 33.5 | 0.2 | bdl | 53.6 | bdl | bdl | bdl | 227 | bdl |
| 42.7 | 0.2 | bdl | 56.3 | bdl | bdl | bdl | 205 | bdl |
| 39.3 | 0.3 | bdl | 67.9 | bdl | bdl | bdl | 269 | bdl |
| 35.0 | 0.2 | bdl | Sat | bdl | bdl | bdl | 287 | bdl |
| 33.9 | 0.2 | bdl | 65.2 | bdl | bdl | bdl | 265 | bdl |
| 43.6 | 0.1 | bdl | 56.8 | bdl | bdl | bdl | 160 | bdl |
| 47.6 | 0.1 | bdl | 61.1 | bdl | bdl | bdl | 175 | bdl |
| 40.7 | 0.1 | bdl | Sat | bdl | bdl | bdl | 142 | bdl |
| 39.2 | 0.1 | bdl | 48.3 | bdl | bdl | bdl | 124 | bdl |
| 40.8 | 0.1 | bdl | Sat | bdl | bdl | bdl | 113 | bdl |
| 33.2 | 0.1 | bdl | Sat | bdl | bdl | bdl | 80 | bdl |
| 38.2 | 0.1 | bdl | Sat | bdl | bdl | bdl | 86 | bdl |
| 38.5 | 0.1 | bdl | Sat | bdl | bdl | bdl | 78 | bdl |
| 37.6 | 0.1 | bdl | Sat | bdl | bdl | bdl | 73 | bdl |
| 37.1 | 0.1 | bdl | Sat | bdl | bdl | bdl | 67 | bdl |

| Se (ppm) | Si (ppm) | Sr (ppm) | Ti (ppm) | Tl (ppm) | V (ppm) | Zn (ppm) |
|---|---|---|---|---|---|---|
| 0.08 | 2.4 | 0.45 | bdl | bdl | bdl | 0.01 |
| 0.07 | 2.0 | 0.43 | bdl | bdl | bdl | 0.02 |
| 0.02 | 0.8 | 0.17 | bdl | bdl | bdl | 0.01 |
| 0.10 | 1.7 | 0.51 | bdl | bdl | bdl | 0.03 |
| 0.16 | 1.7 | 0.48 | bdl | bdl | bdl | 0.03 |
| 0.12 | 1.6 | 0.46 | bdl | bdl | bdl | 0.02 |
| 0.11 | 1.6 | 0.44 | bdl | bdl | bdl | 0.02 |
| 0.13 | 1.6 | 0.44 | bdl | bdl | bdl | 0.03 |
| 0.13 | 1.6 | 0.40 | bdl | bdl | bdl | 0.02 |
| 0.12 | 1.5 | 0.37 | bdl | bdl | bdl | 0.02 |
| 0.10 | 1.5 | 0.37 | bdl | bdl | bdl | 0.02 |
| 0.14 | 1.5 | 0.36 | bdl | bdl | bdl | 0.02 |
| 0.10 | 1.4 | 0.35 | bdl | bdl | bdl | 0.02 |
| 0.12 | 1.5 | 0.36 | bdl | bdl | bdl | 0.01 |
| 0.05 | 1.5 | 0.21 | bdl | bdl | 0.001 | 0.02 |
| 0.04 | 1.5 | 0.21 | bdl | bdl | 0.002 | 0.02 |
| 0.05 | 1.4 | 0.20 | bdl | bdl | 0.001 | 0.02 |
| 0.05 | 1.4 | 0.20 | bdl | bdl | 0.001 | 0.02 |
| 0.05 | 1.5 | 0.20 | bdl | bdl | 0.002 | 0.02 |
| 0.04 | 3.3 | 0.17 | bdl | bdl | 0.005 | 0.01 |
| 0.04 | 1.9 | 0.33 | bdl | bdl | 0.006 | 0.07 |
| 0.04 | 2.0 | 0.27 | bdl | bdl | 0.007 | 0.03 |
| 0.02 | 2.0 | 0.26 | bdl | bdl | 0.009 | 0.02 |
| 0.03 | 1.8 | 0.13 | bdl | bdl | 0.007 | 0.00 |
| 0.04 | 1.9 | 0.14 | bdl | bdl | 0.009 | 0.00 |
| 0.04 | 1.6 | 0.11 | bdl | bdl | 0.002 | 0.00 |
| 0.04 | 1.5 | 0.10 | bdl | bdl | 0.001 | 0.00 |
| 0.03 | 1.5 | 0.10 | bdl | bdl | 0.001 | 0.00 |
| 0.03 | 1.2 | 0.07 | bdl | bdl | bdl | 0.00 |
| 0.03 | 1.3 | 0.08 | bdl | bdl | 0.008 | 0.00 |
| 0.03 | 1.3 | 0.07 | bdl | bdl | 0.007 | 0.00 |
| 0.03 | 1.3 | 0.06 | bdl | bdl | 0.003 | 0.00 |
| 0.02 | 1.2 | 0.06 | bdl | bdl | 0.002 | bdl |

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) |
|---|---|---|---|---|
| Deionized water extraction | | | | |
| Raglan Control Soil | <0.5 | 37 | 378 | 1 |
| Raglan Control Gravel Top | 2.3 | 130 | 42 | <1 |
| Raglan Control Gravel Bottom | <0.5 | 84 | 25 | <1 |
| Raglan Mixed culture Soil | <0.5 | 37 | 249 | <1 |
| Raglan Mixed culture Gravel Top | 0.7 | 185 | 76 | <1 |
| Raglan Mixed culture Gravel Bottom | <0.5 | 63 | 22 | <1 |
| Arrieros/LB Control Soil | <0.5 | 109 | 182 | <1 |
| Arrieros/LB Mixed culture (no meth) Soil | <0.5 | 167 | 288 | <1 |
| Arrieros/LB Methanotroph Soil | <0.5 | 180 | 254 | <1 |
| Arrieros/LB S-oxidizer Soil | <0.5 | 174 | 268 | <1 |
| Arrieros/LB Control Soil | <0.5 | 200 | 247 | <1 |
| Arrieros/LB Mixed culture (with meth) Soil | <0.5 | 192 | 225 | <1 |
| Arrieros/LB Control Gravel Top | <0.5 | 95 | 44 | 2 |
| Arrieros/LB Control Gravel Bottom | <0.5 | 117 | 54 | 2 |
| Arrieros/LB Mixed culture (with meth) Gravel Top | <0.5 | 66 | 50 | <1 |
| Arrieros/LB Mixed culture (with meth) Gravel Bottom | <0.5 | 117 | 63 | 2 |
| Talbot/T7 Mixed culture Soil | 0.7 | 205 | 30 | 4 |
| Talbot/T7 Mixed culture Soil | <0.5 | 195 | 26 | 2 |
| Talbot/T7 Control Carbonate Top | <0.5 | 1 | <5 | 1 |
| Talbot/T7 Control Carbonate Middle | <0.5 | <1 | <5 | <1 |
| Talbot/T7 Control Carbonate Bottom | <0.5 | <1 | <5 | 1 |
| Talbot/T7 Control Carbonate Top | <0.5 | 2 | <5 | 1 |
| Talbot/T7 Control Carbonate Middle | <0.5 | <1 | <5 | <1 |
| Talbot/T7 Control Carbonate Bottom | 0.6 | <1 | <5 | 3 |
| Talbot/T7 Control Carbonate Top | <0.5 | 2 | 5 | <1 |
| Talbot/T7 Control Carbonate Middle | <0.5 | 1 | <5 | <1 |
| Talbot/T7 Control Carbonate Bottom | <0.5 | <1 | <5 | <1 |
| Talbot/T7 Mixed culture Carbonate Top | <0.5 | 2 | <5 | <1 |
| Talbot/T7 Mixed culture Carbonate Middle | <0.5 | <1 | <5 | <1 |
| Talbot/T7 Mixed culture Carbonate Bottom | <0.5 | <1 | <5 | 2 |
| Talbot/T7 Mixed culture Carbonate Top | <0.5 | 2 | <5 | <1 |
| Talbot/T7 Mixed culture Carbonate Middle | <0.5 | <1 | <5 | <1 |
| Talbot/T7 Mixed culture Carbonate Bottom | <0.5 | <1 | <5 | 1 |
| Talbot/T7 Mixed culture Carbonate Top | <0.5 | 3 | <5 | <1 |
| Talbot/T7 Mixed culture Carbonate Middle | <0.5 | 1 | <5 | <1 |
| Talbot/T7 Mixed culture Carbonate Bottom | <0.5 | <1 | <5 | <1 |
| Talbot/T7 Control Soil | <0.5 | 223 | 30 | <1 |
| Talbot/T7 Control Soil | 0.7 | 233 | 32 | <1 |
| Talbot/T7 Control Soil | <0.5 | 219 | 33 | <1 |
| Talbot/T7 Mixed culture Soil | <0.5 | 161 | 21 | 1 |

| Ba (ppb) | Be (ppb) | Bi (ppb) | Br (ppb) | Cd (ppb) | Ce (ppb) | Cl (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | | |
| 509 | 2 | <0.5 | 1501 | 0.6 | 59 | 38 | 118 | 3.8 | 439 |
| 1174 | 4 | 0.6 | 137 | 3.7 | 200 | 6 | 483 | 17.9 | 607 |
| 890 | <1 | <0.5 | 116 | 3.3 | 125 | 3 | 616 | 11.9 | 1102 |
| 434 | 1 | <0.5 | 1154 | 1.0 | 55 | 38 | 131 | 4.2 | 455 |
| 1455 | 4 | 0.9 | 198 | 2.4 | 323 | 7 | 273 | 24.4 | 540 |
| 594 | 2 | <0.5 | 113 | 1.8 | 100 | <2 | 241 | 8.7 | 265 |
| 415 | 2 | 0.6 | 114 | 0.7 | 90 | <2 | 20 | 51.7 | 143 |
| 589 | 6 | 1.0 | 123 | 0.8 | 102 | 4 | 29 | 77.1 | 217 |
| 624 | 5 | 0.9 | 90 | 1.0 | 109 | <2 | 31 | 84.4 | 227 |
| 602 | 7 | 1.0 | 100 | 0.9 | 111 | 2 | 32 | 84.0 | 238 |
| 677 | 9 | 1.1 | 89 | 1.4 | 96 | 2 | 33 | 94.8 | 254 |
| 657 | 6 | 1.2 | 99 | 1.2 | 102 | <2 | 32 | 84.8 | 669 |
| 354 | 4 | 0.7 | 18 | <0.5 | 126 | 13 | 18 | 14.5 | 82 |
| 499 | 3 | 1.1 | 57 | 0.8 | 109 | 12 | 21 | 15.1 | 416 |
| 282 | 4 | <0.5 | 42 | <0.5 | 65 | 6 | 13 | 12.0 | 176 |
| 495 | 2 | 1.2 | 26 | 0.8 | 110 | 6 | 25 | 14.8 | 1150 |
| 961 | 8 | 2.0 | 133 | <0.5 | 124 | 9 | 52 | 17.0 | 103 |
| 871 | 4 | 1.6 | 123 | <0.5 | 124 | 3 | 50 | 16.0 | 103 |
| 43 | <1 | <0.5 | 72 | <0.5 | <1 | 8 | <1 | <0.5 | <5 |
| 41 | <1 | <0.5 | 65 | <0.5 | <1 | 8 | 1 | <0.5 | <5 |
| 39 | <1 | <0.5 | 88 | <0.5 | <1 | 10 | 2 | <0.5 | <5 |
| 43 | 2 | <0.5 | 66 | <0.5 | <1 | 7 | 1 | <0.5 | <5 |
| 66 | <1 | <0.5 | 69 | <0.5 | <1 | 8 | 3 | <0.5 | <5 |
| 103 | <1 | <0.5 | 84 | 0.9 | <1 | 8 | 7 | <0.5 | 54 |
| 35 | <1 | <0.5 | 122 | <0.5 | <1 | 18 | 2 | <0.5 | <5 |
| 49 | <1 | <0.5 | 110 | <0.5 | <1 | 15 | 3 | <0.5 | <5 |
| 71 | <1 | <0.5 | 94 | <0.5 | <1 | 13 | 3 | <0.5 | <5 |
| 51 | 1 | <0.5 | 67 | <0.5 | <1 | 10 | 2 | <0.5 | <5 |
| 65 | <1 | <0.5 | 104 | <0.5 | <1 | 10 | 2 | <0.5 | <5 |
| 127 | <1 | <0.5 | 60 | 1.0 | <1 | 11 | 13 | <0.5 | 398 |
| 39 | <1 | <0.5 | 84 | <0.5 | <1 | 12 | 2 | <0.5 | <5 |
| 55 | <1 | <0.5 | 94 | <0.5 | <1 | 11 | 3 | <0.5 | <5 |
| 91 | <1 | <0.5 | 113 | <0.5 | <1 | 14 | 3 | <0.5 | 17 |
| 40 | 1 | <0.5 | 66 | <0.5 | <1 | 11 | 2 | <0.5 | <5 |
| 52 | <1 | <0.5 | 74 | <0.5 | <1 | 11 | 4 | <0.5 | <5 |
| 62 | 1 | <0.5 | 90 | <0.5 | <1 | 10 | 3 | <0.5 | <5 |
| 1069 | 6 | 2.1 | 110 | <0.5 | 149 | 7 | 56 | 19.3 | 112 |
| 1081 | 9 | 2.2 | 148 | <0.5 | 137 | 6 | 57 | 19.9 | 113 |
| 984 | 4 | 2.1 | 164 | 0.7 | 131 | <2 | 51 | 17.5 | 104 |
| 783 | 6 | 1.5 | 132 | <0.5 | 114 | <2 | 43 | 13.6 | 79 |

| Dy (ppb) | Er (ppb) | Eu (ppb) | Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | | |
| 3.1 | 1.6 | 0.8 | 12.8 | 4.1 | 8.4 | 2.9 | <1 | 0.41 | <0.05 |
| 5.9 | 3.0 | 2.0 | 40.0 | 10.6 | 3.9 | 8.7 | <1 | 1.05 | 0.15 |
| 3.8 | 2.2 | 1.5 | 26.7 | 5.1 | 2.5 | 5.0 | <1 | 0.75 | 0.10 |
| 2.5 | 1.5 | 0.8 | 12.6 | 3.5 | 7.0 | 3.2 | <1 | 0.58 | <0.05 |
| 10.4 | 4.8 | 3.3 | 58.4 | 13.8 | 5.4 | 12.6 | <1 | 1.86 | 0.16 |
| 2.7 | 1.4 | 1.1 | 19.5 | 4.7 | 1.8 | 4.2 | <1 | 0.52 | 0.06 |
| 3.5 | 2.4 | 0.8 | 31.2 | 14.0 | 3.0 | 3.9 | <1 | 0.62 | 0.09 |
| 4.1 | 3.2 | 1.1 | 46.0 | 5.4 | 4.3 | 6.7 | <1 | 0.95 | 0.16 |
| 5.1 | 3.5 | 1.2 | 48.9 | 5.2 | 4.4 | 7.1 | <1 | 1.05 | 0.17 |
| 5.1 | 3.3 | 1.4 | 48.6 | 5.2 | 4.5 | 6.6 | <1 | 1.13 | 0.19 |
| 5.4 | 3.3 | 0.9 | 53.3 | 6.5 | 5.0 | 7.5 | <1 | 1.09 | 0.20 |
| 5.8 | 3.1 | 1.0 | 51.7 | 6.5 | 4.9 | 7.2 | <1 | 1.21 | 0.18 |
| 3.9 | 2.5 | 1.2 | 26.7 | 5.5 | 1.5 | 1.3 | <1 | 0.74 | 0.16 |
| 5.2 | 2.3 | 1.7 | 30.4 | 6.8 | 1.6 | 1.7 | 2 | 1.04 | 0.12 |
| 2.5 | 1.1 | 0.7 | 19.1 | 2.8 | 1.1 | 1.1 | 1 | 0.46 | 0.10 |
| 4.0 | 1.9 | 1.2 | 30.4 | 5.5 | 1.7 | 1.7 | 2 | 0.91 | 0.22 |
| 3.5 | 2.0 | 0.7 | 61.6 | 5.3 | 3.7 | 7.5 | 3 | 0.65 | 0.17 |
| 4.1 | 2.1 | 0.8 | 58.2 | 4.5 | 3.6 | 7.1 | 2 | 0.78 | 0.14 |
| 0.1 | <0.1 | <0.1 | <0.5 | <0.1 | <0.1 | <0.1 | 2 | <0.05 | <0.05 |
| 0.2 | <0.1 | <0.1 | <0.5 | 0.1 | <0.1 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | <0.5 | <0.1 | 0.2 | <0.1 | 2 | <0.05 | <0.05 |
| 0.1 | <0.1 | <0.1 | 0.7 | 0.1 | <0.1 | <0.1 | 1 | <0.05 | <0.05 |
| 0.2 | <0.1 | <0.1 | <0.5 | <0.1 | 0.4 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | 0.8 | <0.1 | 0.2 | <0.1 | 1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | 1.2 | <0.1 | 0.2 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | <0.5 | <0.1 | 0.3 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | <0.5 | <0.1 | 0.2 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | 1.0 | 0.1 | 0.2 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | <0.5 | <0.1 | 0.2 | <0.1 | 2 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | 1.2 | <0.1 | 0.2 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | 0.9 | <0.1 | 0.1 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | <0.5 | <0.1 | 0.2 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | 0.5 | <0.1 | 0.1 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | 1.0 | 1.0 | 0.1 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | <0.5 | <0.1 | 0.3 | <0.1 | <1 | <0.05 | <0.05 |
| <0.1 | <0.1 | <0.1 | <0.5 | <0.1 | 0.1 | <0.1 | <1 | <0.05 | <0.05 |
| 4.5 | 2.4 | 1.1 | 70.6 | 4.3 | 4.6 | 8.6 | <1 | 0.81 | 0.16 |
| 3.8 | 2.3 | 0.8 | 70.0 | 3.8 | 4.1 | 7.5 | <1 | 0.78 | 0.17 |
| 4.0 | 2.7 | 1.0 | 66.0 | 4.3 | 6.6 | 8.3 | <1 | 0.67 | 0.14 |
| 2.9 | 1.7 | 0.6 | 52.7 | 3.6 | 3.4 | 6.4 | <1 | 0.67 | 0.15 |

| La (ppb) | Li (ppb) | Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) | Rb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | | |
| 36 | 31.0 | 0.26 | 50 | 5.4 | 28 | 5518 | 29 | 6.8 | 80 |
| 107 | 95.6 | 0.52 | 12 | 20.1 | 76 | 15195 | 66 | 20.3 | 316 |
| 73 | 72.9 | 0.29 | 6 | 12.6 | 49 | 20776 | 39 | 12.5 | 205 |
| 35 | 30.0 | 0.23 | 36 | 7.6 | 25 | 6316 | 36 | 7.2 | 76 |
| 171 | 140.0 | 0.87 | 21 | 32.3 | 119 | 7558 | 105 | 34.9 | 453 |
| 56 | 44.7 | 0.35 | 5 | 9.6 | 38 | 10528 | 30 | 9.9 | 153 |
| 37 | 244.5 | 0.44 | 17 | 11.8 | 36 | 77 | 38 | 6.3 | 200 |
| 39 | 351.2 | 0.55 | 27 | 16.5 | 29 | 89 | 50 | 8.2 | 303 |
| 41 | 381.1 | 0.49 | 21 | 25.7 | 30 | 49 | 49 | 9.0 | 322 |
| 36 | 369.2 | 0.50 | 23 | 17.3 | 41 | 87 | 59 | 8.7 | 316 |
| 43 | 370.5 | 0.55 | 12 | 17.7 | 30 | 59 | 58 | 8.5 | 361 |
| 42 | 356.7 | 0.51 | 16 | 15.6 | 32 | 47 | 61 | 9.3 | 336 |
| 37 | 90.2 | 0.23 | 8 | 4.1 | 35 | 16 | 109 | 9.5 | 134 |
| 54 | 87.8 | 0.36 | 12 | 6.0 | 38 | 20 | 85 | 9.8 | 161 |
| 21 | 66.6 | 0.22 | 5 | 5.5 | 20 | 13 | 50 | 5.7 | 110 |
| 44 | 76.8 | 0.21 | 18 | 4.5 | 34 | 18 | 97 | 8.8 | 161 |
| 53 | 167.2 | 0.34 | 11 | 27.0 | 35 | 133 | 83 | 10.1 | 482 |
| 53 | 153.5 | 0.33 | 9 | 26.2 | 36 | 131 | 77 | 10.0 | 463 |
| <2 | 3.4 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 7 |
| <2 | 2.1 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 3 |
| <2 | 2.9 | <0.05 | <1 | <0.5 | <1 | <5 | 3 | <0.5 | 3 |
| <2 | 3.8 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 8 |
| <2 | 1.0 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 3 |
| <2 | 7.4 | <0.05 | <1 | <0.5 | <1 | <5 | 4 | <0.5 | 6 |
| <2 | 1.7 | <0.05 | 3 | <0.5 | <1 | <5 | <3 | <0.5 | 11 |
| <2 | 4.1 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 4 |
| <2 | 2.8 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 3 |
| <2 | 1.9 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 7 |
| <2 | 2.1 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 3 |
| <2 | 2.4 | <0.05 | <1 | <0.5 | <1 | <5 | 8 | <0.5 | 8 |
| <2 | 3.5 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 7 |
| <2 | 1.8 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 4 |
| <2 | 6.7 | <0.05 | <1 | <0.5 | <1 | <5 | 5 | <0.5 | 6 |
| <2 | 3.1 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 9 |
| <2 | 2.0 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 5 |
| <2 | 2.0 | <0.05 | <1 | <0.5 | <1 | <5 | <3 | <0.5 | 3 |
| 66 | 174.6 | 0.32 | 8 | 30.3 | 42 | 142 | 83 | 10.5 | 525 |
| 57 | 187.0 | 0.33 | 8 | 32.4 | 39 | 164 | 88 | 11.2 | 557 |
| 57 | 163.0 | 0.38 | 9 | 29.7 | 40 | 138 | 78 | 10.9 | 532 |
| 46 | 121.4 | 0.18 | 6 | 21.9 | 30 | 105 | 66 | 8.1 | 386 |

| Re (ppb) | S (ppm) | Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) | Ta (ppb) | Tb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | | |
| <0.05 | 245 | 13 | 37 | 29 | 5.2 | 1 | 157 | 0.6 | 0.53 |
| 0.06 | 113 | 2 | 89 | 9 | 11.7 | 3 | 154 | 1.7 | 1.25 |
| 0.08 | 143 | 1 | 63 | 9 | 7.4 | 2 | 112 | 1.2 | 0.74 |
| <0.05 | 128 | 12 | 34 | 18 | 4.6 | 1 | 112 | 0.5 | 0.49 |
| <0.05 | 22 | 4 | 125 | 8 | 19.0 | 5 | 149 | 2.7 | 1.76 |
| 0.08 | 58 | 1 | 42 | <5 | 5.7 | 2 | 74 | 0.8 | 0.50 |
| <0.05 | <10 | 5 | 100 | <5 | 6.9 | 6 | 712 | 1.0 | 0.63 |
| <0.05 | 12 | 7 | 143 | <5 | 6.1 | 5 | 890 | 1.5 | 0.83 |
| <0.05 | <10 | 8 | 150 | <5 | 6.6 | 6 | 832 | 1.4 | 0.75 |
| <0.05 | <10 | 8 | 144 | <5 | 7.5 | 5 | 818 | 1.5 | 1.01 |
| <0.05 | <10 | 14 | 155 | <5 | 6.5 | 5 | 984 | 1.5 | 0.95 |
| <0.05 | <10 | 7 | 149 | <5 | 7.7 | 5 | 884 | 1.5 | 0.88 |
| <0.05 | <10 | 3 | 79 | <5 | 7.3 | 3 | 857 | <0.5 | 0.82 |
| <0.05 | <10 | 4 | 94 | <5 | 7.7 | 4 | 441 | <0.5 | 0.98 |
| <0.05 | <10 | 1 | 52 | <5 | 3.6 | 2 | 610 | <0.5 | 0.91 |
| <0.05 | <10 | 3 | 86 | <5 | 9.7 | 4 | 387 | 0.7 | 1.25 |
| <0.05 | 23 | 6 | 98 | 11 | 6.2 | 6 | 286 | 2.6 | 0.71 |
| <0.05 | <10 | 7 | 95 | 9 | 6.4 | 6 | 319 | 2.2 | 0.61 |
| <0.05 | <10 | 2 | <20 | 7 | <0.5 | <1 | 115 | <0.5 | <0.05 |
| <0.05 | 12 | 2 | <20 | <5 | <0.5 | <1 | 83 | <0.5 | <0.05 |
| <0.05 | 19 | 5 | <20 | <5 | <0.5 | <1 | 78 | <0.5 | <0.05 |
| <0.05 | 18 | 2 | <20 | <5 | <0.5 | <1 | 112 | <0.5 | <0.05 |
| <0.05 | 15 | 4 | <20 | <5 | <0.5 | <1 | 87 | <0.5 | <0.05 |
| <0.05 | 124 | 21 | <20 | 34 | <0.5 | <1 | 103 | <0.5 | <0.05 |
| <0.05 | <10 | 3 | <20 | <5 | <0.5 | <1 | 158 | <0.5 | <0.05 |
| <0.05 | 14 | 2 | <20 | <5 | <0.5 | <1 | 127 | <0.5 | <0.05 |
| <0.05 | 17 | 4 | <20 | <5 | <0.5 | <1 | 108 | <0.5 | <0.05 |
| <0.05 | 26 | 4 | <20 | <5 | <0.5 | <1 | 111 | <0.5 | <0.05 |
| <0.05 | 27 | 6 | <20 | <5 | <0.5 | <1 | 101 | <0.5 | <0.05 |
| <0.05 | 228 | 28 | <20 | 66 | <0.5 | <1 | 150 | <0.5 | <0.05 |
| <0.05 | 36 | 2 | <20 | <5 | <0.5 | <1 | 125 | <0.5 | <0.05 |
| <0.05 | 28 | 4 | <20 | <5 | <0.5 | <1 | 113 | <0.5 | <0.05 |
| <0.05 | 76 | 14 | <20 | 18 | <0.5 | <1 | 123 | <0.5 | <0.05 |
| <0.05 | 20 | 7 | <20 | <5 | <0.5 | <1 | 132 | <0.5 | <0.05 |
| <0.05 | 14 | 4 | <20 | 7 | <0.5 | <1 | 107 | <0.5 | <0.05 |
| <0.05 | 12 | 4 | <20 | <5 | <0.5 | <1 | 105 | <0.5 | <0.05 |
| <0.05 | 24 | 6 | 127 | 9 | 6.4 | 7 | 363 | 2.7 | 0.81 |
| <0.05 | 42 | 11 | 119 | 8 | 6.5 | 7 | 323 | 3.0 | 0.66 |
| <0.05 | <10 | 4 | 114 | 9 | 6.9 | 7 | 365 | 2.8 | 0.68 |
| <0.05 | 44 | 11 | 82 | 7 | 4.8 | 5 | 342 | 1.8 | 0.50 |

| Te (ppb) | Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) | Y (ppb) | Yb (ppb) | Zn (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | | |
| <1 | 16 | 2.01 | 0.26 | 4.5 | 284 | <2 | 16 | 1.7 | 141 |
| 1 | 49 | 7.13 | 0.49 | 10.6 | 270 | <2 | 33 | 3.0 | 603 |
| <1 | 28 | 4.67 | 0.34 | 6.5 | 172 | <2 | 20 | 2.1 | 391 |
| <1 | 16 | 2.05 | 0.23 | 3.8 | 226 | <2 | 15 | 1.5 | 184 |
| <1 | 79 | 10.85 | 0.71 | 17.2 | 395 | <2 | 56 | 4.7 | 860 |
| <1 | 25 | 3.48 | 0.20 | 5.0 | 125 | <2 | 17 | 1.8 | 284 |
| <1 | 18 | 3.53 | 0.43 | 7.3 | 162 | 4 | 25 | 2.0 | 189 |
| <1 | 21 | 5.45 | 0.44 | 8.1 | 247 | 4 | 29 | 3.2 | 314 |
| <1 | 24 | 5.21 | 0.42 | 7.6 | 242 | 5 | 30 | 3.1 | 339 |
| <1 | 23 | 6.03 | 0.54 | 7.8 | 270 | 5 | 32 | 3.1 | 329 |
| <1 | 25 | 5.90 | 0.52 | 8.7 | 256 | 4 | 33 | 2.9 | 374 |
| <1 | 23 | 5.35 | 0.46 | 8.6 | 224 | 6 | 37 | 3.2 | 377 |
| <1 | 18 | 1.57 | 0.34 | 2.4 | 126 | 5 | 23 | 1.9 | 204 |
| 1 | 20 | 1.98 | 0.30 | 2.6 | 121 | 3 | 27 | 2.4 | 261 |
| <1 | 13 | 1.35 | 0.15 | 1.7 | 81 | 2 | 26 | 1.1 | 149 |
| <1 | 20 | 1.73 | 0.35 | 2.8 | 127 | 5 | 23 | 1.7 | 249 |
| <1 | 39 | 7.43 | 0.27 | 5.8 | 422 | 5 | 21 | 2.5 | 711 |
| <1 | 38 | 6.86 | 0.27 | 6.2 | 402 | 7 | 22 | 2.4 | 790 |
| <1 | <2 | <0.05 | <0.05 | 1.8 | <50 | <2 | <1 | <0.5 | 43 |
| <1 | <2 | <0.05 | <0.05 | 0.2 | <50 | <2 | <1 | <0.5 | 789 |
| <1 | <2 | <0.05 | <0.05 | <0.1 | <50 | <2 | <1 | <0.5 | 1413 |
| <1 | <2 | <0.05 | <0.05 | 2.0 | <50 | <2 | <1 | <0.5 | 81 |
| <1 | <2 | <0.05 | <0.05 | 0.1 | <50 | <2 | <1 | <0.5 | 1219 |
| <1 | <2 | <0.05 | <0.05 | <0.1 | <50 | <2 | <1 | <0.5 | 1741 |
| <1 | <2 | <0.05 | <0.05 | 3.5 | <50 | <2 | <1 | <0.5 | 108 |
| <1 | <2 | <0.05 | <0.05 | 0.6 | <50 | <2 | <1 | <0.5 | 679 |
| <1 | <2 | <0.05 | <0.05 | 0.1 | <50 | <2 | <1 | <0.5 | 1454 |
| <1 | <2 | <0.05 | <0.05 | 1.7 | <50 | <2 | <1 | <0.5 | 131 |
| <1 | <2 | <0.05 | <0.05 | 0.3 | <50 | <2 | <1 | <0.5 | 483 |
| <1 | <2 | <0.05 | <0.05 | <0.1 | <50 | <2 | <1 | <0.5 | 3032 |
| <1 | <2 | <0.05 | <0.05 | 2.8 | <50 | <2 | <1 | <0.5 | 56 |
| <1 | <2 | <0.05 | <0.05 | 0.3 | <50 | <2 | <1 | <0.5 | 545 |
| <1 | <2 | <0.05 | <0.05 | <0.1 | <50 | <2 | <1 | <0.5 | 1305 |
| <1 | <2 | <0.05 | <0.05 | 3.2 | <50 | <2 | <1 | <0.5 | 39 |
| <1 | <2 | <0.05 | <0.05 | 0.7 | <50 | <2 | <1 | <0.5 | 361 |
| <1 | <2 | <0.05 | <0.05 | 0.2 | <50 | <2 | <1 | <0.5 | 1145 |
| <1 | 44 | 8.41 | 0.32 | 7.6 | 482 | 5 | 23 | 2.5 | 1458 |
| <1 | 44 | 8.49 | 0.28 | 6.4 | 473 | 5 | 23 | 2.5 | 771 |
| <1 | 44 | 7.87 | 0.23 | 7.0 | 434 | 5 | 24 | 2.8 | 1027 |
| <1 | 32 | 5.88 | 0.23 | 7.3 | 327 | 5 | 17 | 1.6 | 671 |

| Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) | Na (ppm) | P (ppm) | Tl (ppb) |
|---|---|---|---|---|---|---|---|---|
| Deionized water extraction | | | | | | | | |
| 107 | 49 | 62.1 | 139 | 85.6 | 15013 | 91 | 5.7 | 0.6 |
| 371 | 29 | 186.1 | 60 | 90.0 | 11901 | 24 | 2.7 | 2.3 |
| 187 | 35 | 123.2 | 54 | 89.9 | 8238 | 18 | 1.6 | 1.5 |
| 107 | 43 | 60.1 | 90 | 69.9 | 10699 | 70 | 5.2 | 0.6 |
| 510 | 14 | 268.6 | 71 | 74.2 | 6095 | 26 | 4.4 | 3.2 |
| 143 | 12 | 92.9 | 38 | 50.6 | 4071 | 16 | 1.4 | 1.1 |
| 135 | 137 | 63.3 | 154 | 46.3 | 1254 | 47 | 2.1 | 0.9 |
| 230 | 164 | 88.2 | 164 | 68.5 | 1813 | 48 | 2.3 | 1.5 |
| 232 | 143 | 92.5 | 177 | 73.3 | 1922 | 53 | 2.4 | 1.7 |
| 211 | 154 | 92.3 | 161 | 70.1 | 1903 | 50 | 2.8 | 1.6 |
| 246 | 121 | 98.2 | 194 | 85.7 | 2119 | 49 | 2.8 | 1.8 |
| 235 | 122 | 99.2 | 179 | 80.5 | 2069 | 45 | 3.1 | 1.6 |
| 50 | 113 | 56.6 | 91 | 39.7 | 1456 | 25 | 0.6 | 0.7 |
| 49 | 101 | 68.4 | 95 | 52.4 | 1870 | 25 | 0.9 | 0.9 |
| 44 | 100 | 40.5 | 74 | 32.5 | 1077 | 18 | 0.7 | 0.6 |
| 43 | 97 | 68.9 | 88 | 50.1 | 2244 | 24 | 1.5 | 0.9 |
| 237 | 181 | 150.2 | 101 | 129.4 | 6492 | 28 | 3.5 | 1.6 |
| 232 | 198 | 143.6 | 91 | 131.6 | 5536 | 23 | 3.5 | 1.5 |
| <1 | 144 | <0.1 | 7 | 67.1 | 108 | 3 | <0.1 | <0.2 |
| <1 | 166 | <0.1 | 5 | 69.2 | 355 | <3 | <0.1 | <0.2 |
| <1 | 175 | <0.1 | 4 | 67.0 | 745 | <3 | <0.1 | <0.2 |
| <1 | 165 | 0.1 | 8 | 79.8 | 125 | 4 | <0.1 | <0.2 |
| <1 | 180 | <0.1 | 5 | 72.0 | 365 | 3 | <0.1 | <0.2 |
| <1 | 228 | 0.6 | 6 | 81.9 | 986 | 3 | <0.1 | 0.8 |
| <1 | 164 | 0.1 | 8 | 74.8 | 101 | 4 | 0.1 | <0.2 |
| <1 | 171 | <0.1 | 5 | 73.8 | 247 | <3 | <0.1 | <0.2 |
| <1 | 186 | <0.1 | 5 | 70.1 | 456 | 3 | <0.1 | <0.2 |
| <1 | 161 | <0.1 | 7 | 76.8 | 149 | 3 | <0.1 | <0.2 |
| <1 | 167 | <0.1 | 5 | 68.4 | 266 | <3 | <0.1 | <0.2 |
| <1 | 321 | <0.1 | 7 | 98.7 | 1411 | 4 | <0.1 | 1.3 |
| <1 | 169 | <0.1 | 8 | 77.4 | 113 | 4 | 0.1 | <0.2 |
| <1 | 183 | <0.1 | 6 | 78.5 | 205 | 4 | <0.1 | <0.2 |
| <1 | 212 | <0.1 | 6 | 75.9 | 508 | 4 | <0.1 | 0.4 |
| <1 | 159 | <0.1 | 10 | 78.8 | 99 | 4 | <0.1 | <0.2 |
| <1 | 176 | <0.1 | 6 | 81.3 | 170 | 3 | <0.1 | <0.2 |
| <1 | 183 | <0.1 | 5 | 72.0 | 337 | 3 | <0.1 | <0.2 |
| 273 | 239 | 175.2 | 104 | 149.8 | 6305 | 24 | 3.4 | 1.7 |
| 260 | 175 | 166.3 | 116 | 131.4 | 6122 | 30 | 3.4 | 1.8 |
| 260 | 232 | 160.8 | 93 | 140.9 | 5204 | 25 | 3.3 | 1.8 |
| 192 | 258 | 128.3 | 91 | 153.9 | 5478 | 20 | 3.0 | 1.2 |

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) |
|---|---|---|---|---|
| Na-acetate extraction | | | | |
| Raglan Control Soil | <3 | 204 | 1327 | 5 |
| Raglan Control Gravel Top | <3 | 52 | <100 | <1 |
| Raglan Control Gravel Bottom | <3 | 45 | <100 | <1 |
| Raglan Mixed culture Soil | <3 | 139 | 521 | <1 |
| Raglan Mixed culture Gravel Top | <3 | 43 | 624 | 1 |
| Raglan Mixed culture Gravel Bottom | <3 | 40 | <100 | <1 |
| Arrieros/LB Control Soil | <3 | 77 | 2248 | 2 |
| Arrieros/LB Mixed culture (no meth) Soil | <3 | 90 | 4916 | 2 |
| Arrieros/LB Methanotroph Soil | <3 | 98 | 2817 | <1 |
| Arrieros/LB S-oxidizer Soil | <3 | 94 | 2972 | <1 |
| Arrieros/LB Control Soil | <3 | 107 | 2816 | <1 |
| Arrieros/LB Mixed culture (with meth) Soil | <3 | 104 | 2072 | 2 |
| Arrieros/LB Control Gravel Top | <3 | 18 | <100 | <1 |
| Arrieros/LB Control Gravel Bottom | <3 | 23 | 193 | <1 |
| Arrieros/LB Mixed culture (with meth) Gravel Top | <3 | 22 | 260 | 4 |
| Arrieros/LB Mixed culture (with meth) Gravel Bottom | <3 | 24 | <100 | 3 |
| Talbot/T7 Mixed culture Soil | <3 | 79 | <100 | 4 |
| Talbot/T7 Mixed culture Soil | <3 | 71 | <100 | 2 |
| Talbot/T7 Control Carbonate Top | <3 | 13 | <100 | 2 |
| Talbot/T7 Control Carbonate Middle | <3 | 12 | <100 | 2 |
| Talbot/T7 Control Carbonate Bottom | <3 | 13 | <100 | 6 |
| Talbot/T7 Control Carbonate Top | <3 | 13 | 181 | 2 |
| Talbot/T7 Control Carbonate Middle | <3 | 14 | <100 | <1 |
| Talbot/T7 Control Carbonate Bottom | <3 | 15 | 729 | 3 |
| Talbot/T7 Control Carbonate Top | <3 | 16 | <100 | <1 |
| Talbot/T7 Control Carbonate Middle | <3 | 12 | 529 | <1 |
| Talbot/T7 Control Carbonate Bottom | <3 | 15 | 191 | <1 |
| Talbot/T7 Mixed culture Carbonate Top | <3 | 12 | 237 | 3 |
| Talbot/T7 Mixed culture Carbonate Middle | <3 | 12 | 205 | 2 |
| Talbot/T7 Mixed culture Carbonate Bottom | <3 | 16 | 1662 | 1 |
| Talbot/T7 Mixed culture Carbonate Top | <3 | 14 | <100 | <1 |
| Talbot/T7 Mixed culture Carbonate Middle | <3 | 15 | 172 | <1 |
| Talbot/T7 Mixed culture Carbonate Bottom | <3 | 16 | 548 | 7 |
| Talbot/T7 Mixed culture Carbonate Top | <3 | 14 | <100 | <1 |
| Talbot/T7 Mixed culture Carbonate Middle | <3 | 13 | <100 | 3 |
| Talbot/T7 Mixed culture Carbonate Bottom | <3 | 15 | <100 | 4 |
| Talbot/T7 Control Soil | <3 | 74 | 157 | <1 |
| Talbot/T7 Control Soil | <3 | 92 | <100 | 1 |
| Talbot/T7 Control Soil | <3 | 83 | 480 | 2 |
| Talbot/T7 Mixed culture Soil | <3 | 65 | <100 | <1 |

| Ba (ppb) | Be (ppb) | Bi (ppb) | Br (ppb) | Cd (ppb) | Ce (ppb) | Cl (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Na-acetate extraction | | | | | | | | | |
| 32011 | 66 | 19 | | 69 | 8090 | | 4003 | <5 | 6747 |
| 20127 | <20 | <5 | | 41 | 6543 | | 4974 | <5 | 5431 |
| 14520 | 33 | <5 | | 28 | 5564 | | 4152 | <5 | 5172 |
| 22864 | 65 | 11 | | 69 | 4985 | | 3975 | <5 | 4800 |
| 17781 | <20 | <5 | | 46 | 5553 | | 2934 | <5 | 2017 |
| 12378 | <20 | <5 | | 20 | 4477 | | 2417 | <5 | 2470 |
| 11532 | <20 | <5 | | 48 | 438 | | 21 | 98 | 266 |
| 16045 | <20 | <5 | | 78 | 406 | | <20 | 118 | 324 |
| 15963 | <20 | <5 | | 62 | 448 | | 26 | 118 | 299 |
| 14990 | <20 | <5 | | 56 | 389 | | <20 | 111 | 309 |
| 13717 | <20 | <5 | | 65 | 473 | | 23 | 110 | 276 |
| 13429 | <20 | <5 | | 54 | 632 | | 61 | 95 | 10021 |
| 4843 | <20 | <5 | | <20 | 390 | | 61 | 8 | 33 |
| 7365 | <20 | 9 | | 41 | 455 | | 117 | 7 | 5214 |
| 3878 | <20 | <5 | | <20 | 244 | | 69 | 7 | 1183 |
| 7007 | 29 | 5 | | 44 | 529 | | 220 | 7 | 14609 |
| 14806 | <20 | 15 | | <20 | 1829 | | 373 | 6 | 144 |
| 13008 | 58 | 10 | | <20 | 1800 | | 353 | <5 | 90 |
| 1131 | <20 | <5 | | <20 | 236 | | 148 | <5 | <20 |
| 825 | <20 | <5 | | <20 | 180 | | 219 | <5 | 270 |
| 655 | <20 | <5 | | 62 | 164 | | 213 | <5 | 1492 |
| 1547 | <20 | <5 | | <20 | 294 | | 257 | <5 | <20 |
| 1303 | 34 | <5 | | <20 | 204 | | 576 | <5 | 353 |
| 777 | <20 | 10 | | 298 | 180 | | 516 | <5 | 10660 |
| 1492 | <20 | <5 | | <20 | 291 | | 300 | <5 | 32 |
| 920 | <20 | <5 | | <20 | 188 | | 366 | <5 | 243 |
| 1147 | <20 | <5 | | 22 | 204 | | 412 | <5 | 530 |
| 1156 | <20 | <5 | | <20 | 238 | | 236 | <5 | <20 |
| 912 | 24 | <5 | | <20 | 207 | | 337 | <5 | <20 |
| 924 | <20 | 7 | | 420 | 207 | | 618 | <5 | 17350 |
| 1348 | <20 | <5 | | <20 | 298 | | 339 | <5 | 22 |
| 1228 | <20 | <5 | | <20 | 236 | | 582 | <5 | <20 |
| 1184 | <20 | <5 | | 149 | 223 | | 445 | <5 | 2762 |
| 1495 | 25 | <5 | | <20 | 315 | | 385 | <5 | <20 |
| 1078 | <20 | <5 | | <20 | 231 | | 597 | <5 | <20 |
| 1205 | <20 | <5 | | 37 | 219 | | 662 | <5 | 280 |
| 12109 | <20 | <5 | | <20 | 1596 | | 302 | <5 | 42 |
| 15979 | <20 | 13 | | <20 | 1856 | | 385 | <5 | 94 |
| 14607 | 26 | 6 | | <20 | 1815 | | 253 | 6 | 47 |
| 11048 | <20 | 6 | | <20 | 1659 | | 375 | <5 | 54 |

| Dy (ppb) | Er (ppb) | Eu (ppb) | Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Na-acetate extraction | | | | | | | | | |
| 344 | 150 | 133 | <20 | 708 | <50 | <20 | 22 | 61 | <10 |
| 200 | 85 | 86 | <20 | 440 | <50 | <20 | <5 | 36 | <10 |
| 134 | 72 | 64 | <20 | 296 | <50 | <20 | 9 | 25 | <10 |
| 217 | 104 | 86 | <20 | 460 | <50 | <20 | 14 | 38 | <10 |
| 197 | 81 | 77 | <20 | 384 | <50 | <20 | <5 | 33 | <10 |
| 116 | 58 | 56 | <20 | 269 | <50 | <20 | 11 | 22 | <10 |
| 125 | 59 | 37 | <20 | 201 | <50 | <20 | <5 | 23 | <10 |
| 126 | 69 | 39 | <20 | 183 | <50 | <20 | 10 | 24 | <10 |
| 126 | 70 | 41 | <20 | 196 | <50 | <20 | 6 | 28 | <10 |
| 122 | 70 | 32 | <20 | 189 | <50 | <20 | 6 | 23 | <10 |
| 127 | 71 | 41 | <20 | 203 | <50 | <20 | <5 | 26 | <10 |
| 127 | 64 | 35 | <20 | 197 | <50 | <20 | 20 | 25 | <10 |
| 113 | 62 | 38 | <20 | 163 | <50 | <20 | <5 | <20 | <10 |
| 175 | 81 | 50 | <20 | 248 | <50 | <20 | <5 | 29 | <10 |
| 72 | 26 | 21 | <20 | 115 | <50 | <20 | <5 | <20 | <10 |
| 143 | 77 | 44 | <20 | 207 | <50 | <20 | 9 | 28 | <10 |
| 48 | 23 | 15 | <20 | 79 | <50 | <20 | <5 | <20 | <10 |
| 44 | 22 | 14 | <20 | 80 | <50 | <20 | 7 | <20 | <10 |
| 12 | 5 | <5 | <20 | 17 | <50 | <20 | 20 | <20 | <10 |
| 9 | <5 | <5 | <20 | 12 | <50 | <20 | <5 | <20 | <10 |
| 7 | <5 | <5 | <20 | 13 | <50 | <20 | 6 | <20 | <10 |
| 9 | 8 | <5 | <20 | 19 | <50 | <20 | 8 | <20 | <10 |
| 13 | 5 | <5 | <20 | 11 | <50 | <20 | <5 | <20 | <10 |
| 11 | <5 | <5 | <20 | 21 | <50 | <20 | <5 | <20 | <10 |
| 11 | 9 | <5 | <20 | 15 | <50 | <20 | 15 | <20 | <10 |
| 6 | 6 | <5 | <20 | 13 | <50 | <20 | 7 | <20 | <10 |
| 10 | <5 | <5 | <20 | 10 | <50 | <20 | <5 | <20 | <10 |
| 9 | 5 | <5 | <20 | 14 | <50 | <20 | <5 | <20 | <10 |
| 11 | 5 | <5 | <20 | 13 | <50 | <20 | 11 | <20 | <10 |
| 14 | 9 | <5 | <20 | 17 | <50 | <20 | <5 | <20 | <10 |
| 10 | 8 | <5 | <20 | 24 | <50 | <20 | 19 | <20 | <10 |
| 6 | 6 | <5 | <20 | 18 | <50 | <20 | 7 | <20 | <10 |
| 8 | 8 | <5 | <20 | 20 | <50 | <20 | <5 | <20 | <10 |
| 5 | 9 | <5 | <20 | 16 | <50 | <20 | <5 | <20 | <10 |
| 8 | 7 | <5 | <20 | 18 | <50 | <20 | <5 | <20 | <10 |
| <5 | 9 | <5 | <20 | 14 | <50 | <20 | <5 | <20 | <10 |
| 38 | 16 | 13 | 23 | 74 | <50 | <20 | <5 | <20 | <10 |
| 38 | 23 | 14 | 25 | 69 | <50 | <20 | <5 | <20 | <10 |
| 38 | 19 | 13 | 25 | 88 | <50 | <20 | <5 | <20 | <10 |
| 47 | 21 | 12 | <20 | 63 | <50 | <20 | <5 | <20 | <10 |

| La (ppb) | Li (ppb) | Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) | Rb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Na-acetate extraction | | | | | | | | | |
| 5330 | 30 | 15 | <10 | <10 | 4628 | 217595 | 3492 | 1104 | 81 |
| 4037 | <20 | 11 | <10 | <10 | 3073 | 190855 | 620 | 762 | 46 |
| 2992 | 57 | 10 | <10 | <10 | 2353 | 160892 | 480 | 606 | 59 |
| 3270 | 51 | 10 | <10 | <10 | 2825 | 220225 | 2158 | 684 | 64 |
| 3514 | 51 | 9 | <10 | <10 | 2684 | 167104 | 589 | 681 | 56 |
| 2417 | 38 | 8 | <10 | <10 | 1868 | 127558 | 378 | 479 | 61 |
| 900 | 234 | 8 | <10 | <10 | 937 | 427 | 97 | 222 | 485 |
| 869 | 235 | 8 | <10 | <10 | 923 | 278 | 85 | 212 | 624 |
| 940 | 222 | 8 | <10 | <10 | 972 | 242 | 90 | 211 | 589 |
| 837 | 241 | 9 | <10 | <10 | 860 | 190 | 120 | 204 | 581 |
| 876 | 216 | 11 | <10 | <10 | 915 | 200 | 109 | 215 | 551 |
| 905 | 123 | 10 | <10 | <10 | 894 | 245 | 158 | 222 | 462 |
| 720 | 28 | 8 | <10 | <10 | 867 | 69 | 183 | 204 | 115 |
| 969 | 54 | 9 | <10 | <10 | 1176 | 109 | 235 | 284 | 207 |
| 432 | 34 | <5 | <10 | <10 | 558 | <50 | 172 | 121 | 92 |
| 945 | 41 | 10 | <10 | <10 | 1135 | 122 | 356 | 259 | 184 |
| 526 | 41 | <5 | <10 | <10 | 445 | 192 | 620 | 124 | 620 |
| 503 | 48 | <5 | <10 | <10 | 401 | 203 | 626 | 103 | 590 |
| 109 | 142 | <5 | <10 | <10 | 82 | 420 | 110 | 20 | 22 |
| 90 | 149 | <5 | <10 | <10 | 76 | 361 | 140 | 15 | 9 |
| 76 | 92 | <5 | <10 | <10 | 52 | 286 | 870 | 15 | 10 |
| 128 | 149 | <5 | <10 | <10 | 113 | 392 | 201 | 22 | 28 |
| 104 | 121 | <5 | <10 | <10 | 77 | 368 | 200 | 18 | 11 |
| 89 | 135 | <5 | <10 | <10 | 67 | 258 | 14734 | 18 | 16 |
| 124 | 238 | <5 | <10 | <10 | 103 | 536 | 259 | 25 | 40 |
| 89 | 172 | <5 | <10 | <10 | 67 | 433 | 206 | 16 | 13 |
| 93 | 121 | <5 | <10 | <10 | 73 | 442 | 385 | 18 | 11 |
| 108 | 173 | <5 | <10 | <10 | 81 | 429 | 85 | 21 | 21 |
| 93 | 173 | <5 | <10 | <10 | 70 | 398 | 111 | 19 | 10 |
| 104 | 84 | <5 | <10 | <10 | 101 | 311 | 29127 | 20 | 18 |
| 124 | 129 | <5 | <10 | <10 | 112 | 437 | 333 | 28 | 22 |
| 110 | 174 | <5 | <10 | <10 | 92 | 521 | 371 | 20 | 14 |
| 111 | 144 | <5 | <10 | <10 | 75 | 281 | 7417 | 22 | 17 |
| 131 | 159 | <5 | <10 | <10 | 97 | 418 | 277 | 25 | 31 |
| 106 | 152 | <5 | <10 | <10 | 70 | 419 | 253 | 18 | 15 |
| 112 | 114 | <5 | <10 | <10 | 84 | 342 | 398 | 20 | 12 |
| 462 | 68 | <5 | <10 | <10 | 411 | 214 | 464 | 97 | 512 |
| 517 | 98 | <5 | <10 | <10 | 445 | 189 | 628 | 110 | 648 |
| 557 | 75 | <5 | <10 | <10 | 418 | 233 | 491 | 104 | 723 |
| 460 | 160 | <5 | <10 | <10 | 386 | 316 | 500 | 94 | 437 |

| Re (ppb) | S (ppm) | Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) | Ta (ppb) | Tb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Na-acetate extraction | | | | | | | | | |
| <2 | | 5 | <100 | <200 | 730 | <20 | 3246 | <20 | 77 |
| <2 | | <5 | <100 | <200 | 472 | <20 | 660 | <20 | 46 |
| <2 | | <5 | <100 | <200 | 376 | <20 | 250 | <20 | 33 |
| <2 | | 6 | <100 | <200 | 451 | <20 | 2368 | <20 | 47 |
| <2 | | <5 | <100 | <200 | 413 | <20 | 844 | <20 | 41 |
| <2 | | <5 | <100 | <200 | 303 | <20 | 357 | <20 | 30 |
| <2 | | 11 | <100 | <200 | 179 | <20 | 15809 | <20 | 25 |
| <2 | | 12 | <100 | <200 | 187 | <20 | 22318 | <20 | 24 |
| <2 | | 12 | <100 | <200 | 166 | <20 | 20365 | <20 | 26 |
| <2 | | 11 | <100 | <200 | 176 | <20 | 18079 | <20 | 26 |
| <2 | | 11 | <100 | <200 | 171 | <20 | 20525 | <20 | 26 |
| <2 | | 10 | <100 | <200 | 213 | <20 | 18072 | <20 | 24 |
| <2 | | 6 | <100 | <200 | 161 | <20 | 9571 | <20 | 23 |
| <2 | | 7 | <100 | <200 | 240 | <20 | 5481 | <20 | 31 |
| <2 | | <5 | <100 | <200 | 116 | <20 | 5106 | <20 | 17 |
| <2 | | 6 | <100 | <200 | 195 | <20 | 4774 | <20 | 28 |
| <2 | | 9 | <100 | <200 | 85 | <20 | 3108 | <20 | 11 |
| <2 | | 11 | <100 | <200 | 61 | <20 | 3308 | <20 | 11 |
| <2 | | <5 | <100 | <200 | 14 | <20 | 4052 | <20 | <5 |
| <2 | | 8 | <100 | <200 | 12 | <20 | 3247 | <20 | <5 |
| <2 | | 39 | <100 | <200 | 13 | <20 | 2441 | <20 | <5 |
| <2 | | <5 | <100 | <200 | 17 | <20 | 4220 | <20 | <5 |
| <2 | | 21 | <100 | <200 | 11 | <20 | 3429 | <20 | <5 |
| <2 | | 86 | <100 | <200 | 13 | <20 | 2512 | <20 | <5 |
| <2 | | <5 | <100 | <200 | 17 | <20 | 4261 | <20 | <5 |
| <2 | | 5 | <100 | <200 | 10 | <20 | 3295 | <20 | <5 |
| <2 | | 21 | <100 | <200 | 10 | <20 | 3205 | <20 | <5 |
| <2 | | 6 | <100 | <200 | 9 | <20 | 3672 | <20 | <5 |
| <2 | | 12 | <100 | <200 | 15 | <20 | 3128 | <20 | <5 |
| <2 | | 103 | <100 | <200 | 14 | <20 | 2940 | <20 | <5 |
| <2 | | <5 | <100 | <200 | 17 | <20 | 4540 | <20 | <5 |
| <2 | | 8 | <100 | <200 | 13 | <20 | 3824 | <20 | <5 |
| <2 | | 52 | <100 | <200 | 13 | <20 | 3321 | <20 | <5 |
| <2 | | 11 | <100 | <200 | 17 | <20 | 3906 | <20 | <5 |
| <2 | | 9 | <100 | <200 | 9 | <20 | 3838 | <20 | <5 |
| <2 | | 20 | <100 | <200 | 12 | <20 | 3538 | <20 | <5 |
| <2 | | 6 | <100 | <200 | 64 | <20 | 3066 | <20 | 8 |
| <2 | | 11 | <100 | <200 | 76 | <20 | 2944 | <20 | 10 |
| <2 | | 6 | <100 | <200 | 93 | <20 | 3300 | <20 | 8 |
| <2 | | 14 | <100 | <200 | 65 | <20 | 3188 | <20 | 9 |

| Te (ppb) | Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) | Y (ppb) | Yb (ppb) | Zn (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Na-acetate extraction | | | | | | | | | |
| <20 | 520 | <1 | 18 | 399 | <50 | <10 | 1938 | 107 | 3257 |
| <20 | 249 | <1 | 9 | 180 | <50 | <10 | 1180 | 71 | 472 |
| <20 | 232 | <1 | 8 | 140 | <50 | <10 | 852 | 54 | 376 |
| <20 | 282 | <1 | 11 | 267 | <50 | <10 | 1241 | 65 | 2557 |
| <20 | 229 | <1 | 9 | 163 | <50 | <10 | 1039 | 73 | 574 |
| <20 | 190 | <1 | 7 | 117 | <50 | <10 | 692 | 47 | 318 |
| <20 | 133 | 2 | 9 | 38 | <50 | <10 | 754 | 58 | 101 |
| <20 | 163 | 2 | 8 | 47 | <50 | <10 | 759 | 58 | 127 |
| <20 | 164 | 1 | 8 | 40 | <50 | <10 | 762 | 55 | <100 |
| <20 | 143 | 2 | 9 | 41 | <50 | <10 | 741 | 55 | <100 |
| <20 | 171 | 2 | 9 | 45 | <50 | <10 | 791 | 67 | 112 |
| <20 | 161 | <1 | 9 | 42 | <50 | <10 | 782 | 60 | 285 |
| <20 | 161 | <1 | 6 | 28 | 154 | <10 | 661 | 50 | 221 |
| <20 | 213 | <1 | 11 | 39 | <50 | <10 | 894 | 60 | 788 |
| <20 | 117 | <1 | <5 | 25 | <50 | <10 | 403 | 20 | 144 |
| <20 | 228 | <1 | 10 | 41 | 69 | 22 | 847 | 68 | 707 |
| <20 | 361 | <1 | <5 | 44 | 240 | <10 | 217 | 17 | 5098 |
| <20 | 315 | <1 | <5 | 39 | 107 | <10 | 187 | 20 | 5979 |
| <20 | 33 | <1 | <5 | 25 | 190 | <10 | 62 | <5 | 38120 |
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| <20 | 20 | <1 | <5 | 13 | 62 | <10 | 44 | <5 | 236194 |
| <20 | 37 | <1 | <5 | 30 | 155 | <10 | 66 | <5 | 36037 |
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| <20 | 30 | <1 | <5 | 19 | <50 | <10 | 70 | 6 | 346227 |
| <20 | 48 | <1 | <5 | 37 | <50 | <10 | 70 | 6 | 43589 |
| <20 | 22 | <1 | <5 | 27 | <50 | <10 | 51 | 7 | 110144 |
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| <20 | 26 | <1 | <5 | 23 | <50 | <10 | 59 | <5 | 42553 |
| <20 | <20 | <1 | <5 | 23 | <50 | <10 | 47 | <5 | 144866 |
| 22 | 25 | <1 | <5 | 21 | <50 | <10 | 101 | 6 | 374305 |
| <20 | 33 | <1 | <5 | 31 | <50 | <10 | 75 | 6 | 36515 |
| <20 | 25 | <1 | <5 | 31 | <50 | <10 | 66 | <5 | 164588 |
| 23 | 25 | <1 | <5 | 22 | <50 | <10 | 70 | 6 | 354494 |
| <20 | 47 | <1 | <5 | 24 | <50 | <10 | 66 | <5 | 28743 |
| <20 | 21 | <1 | <5 | 24 | <50 | <10 | 62 | <5 | 89601 |
| <20 | 25 | <1 | <5 | 27 | <50 | <10 | 57 | 6 | 271070 |
| <20 | 292 | <1 | <5 | 38 | <50 | <10 | 189 | 12 | 10568 |
| <20 | 345 | <1 | <5 | 49 | <50 | <10 | 201 | 15 | 3110 |
| <20 | 322 | <1 | <5 | 42 | <50 | <10 | 203 | 13 | 8436 |
| <20 | 265 | <1 | <5 | 38 | <50 | <10 | 166 | 10 | 3692 |

| Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) | Na (ppm) | P (ppm) | Tl (ppb) |
|---|---|---|---|---|---|---|---|---|
| Na-acetate extraction | | | | | | | | |
| 192 | 1035 | 1203 | 36 | 550 | 243819 | | 11 | <5 |
| 84 | 178 | 80 | 13 | 178 | 65597 | | <5 | <5 |
| 41 | 120 | 71 | 12 | 146 | 28941 | | <5 | <5 |
| 123 | 913 | 757 | 32 | 464 | 178247 | | 7 | <5 |
| 243 | 169 | 57 | 11 | 161 | 67039 | | <5 | <5 |
| 42 | 76 | 54 | 10 | 127 | 21348 | | <5 | <5 |
| 67 | 5387 | 19 | 104 | 77 | 3603 | | 74 | <5 |
| 29 | 8454 | 29 | 138 | 98 | 2929 | | 89 | 5 |
| <20 | 6816 | 19 | 132 | 93 | 4623 | | 85 | 5 |
| 27 | 6421 | 19 | 118 | 89 | 3400 | | 85 | 5 |
| <20 | 6743 | 15 | 125 | 145 | 5491 | | 76 | <5 |
| <20 | 5947 | 14 | 103 | 150 | 9314 | | 65 | <5 |
| <20 | 3995 | 8 | 17 | 109 | 13979 | | 19 | <5 |
| <20 | 4539 | 6 | 19 | 190 | 21324 | | 21 | <5 |
| <20 | 2232 | <5 | 13 | 82 | 13312 | | 13 | <5 |
| <20 | 5028 | 8 | 17 | 163 | 33166 | | 17 | <5 |
| 165 | 7126 | 122 | 24 | 3241 | 114343 | | <5 | 6 |
| 144 | 8388 | 103 | 18 | 3946 | 95810 | | <5 | <5 |
| 28 | 21756 | 142 | <5 | 10976 | 26072 | | <5 | <5 |
| <20 | 17604 | 137 | <5 | 8419 | 38925 | | <5 | <5 |
| <20 | 13805 | 118 | <5 | 6475 | 48406 | | <5 | <5 |
| 29 | 23496 | 159 | <5 | 11253 | 26605 | | <5 | <5 |
| <20 | 17582 | 154 | <5 | 8429 | 51022 | | <5 | <5 |
| <20 | 13227 | 173 | <5 | 6437 | 53627 | | <5 | 12 |
| 32 | 22835 | 158 | <5 | 11638 | 27307 | | <5 | <5 |
| <20 | 18572 | 122 | <5 | 8842 | 26215 | | <5 | <5 |
| <20 | 16293 | 142 | <5 | 7946 | 49175 | | <5 | <5 |
| 29 | 19785 | 147 | <5 | 9708 | 24789 | | <5 | <5 |
| 21 | 17718 | 142 | <5 | 8501 | 35385 | | <5 | <5 |
| <20 | 14221 | 195 | <5 | 6712 | 57078 | | <5 | 19 |
| 43 | 24890 | 176 | <5 | 11985 | 29393 | | <5 | <5 |
| 25 | 20266 | 157 | <5 | 9691 | 37017 | | <5 | <5 |
| <20 | 17508 | 173 | <5 | 8449 | 61120 | | <5 | 5 |
| 34 | 22689 | 153 | <5 | 10814 | 25823 | | <5 | <5 |
| 24 | 20639 | 155 | <5 | 10485 | 27240 | | <5 | <5 |
| <20 | 18708 | 168 | <5 | 8838 | 49290 | | <5 | <5 |
| 147 | 8583 | 108 | 16 | 4005 | 86841 | | <5 | <5 |
| 175 | 5069 | 120 | 21 | 2595 | 108200 | | <5 | 6 |
| 161 | 8325 | 88 | 17 | 3835 | 82436 | | <5 | <5 |
| 132 | 11224 | 153 | 13 | 5244 | 92280 | | <5 | <5 |

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) |
|---|---|---|---|---|
| 0.1M Na-pyrophosphate | | | | |
| Raglan Control Soil | 9 | 986 | 1376 | 10 |
| Raglan Control Gravel Top | 3 | 831 | 531 | 3 |
| Raglan Control Gravel Bottom | 4 | 661 | 443 | 10 |
| Raglan Mixed culture Soil | 8 | 919 | 1178 | 10 |
| Raglan Mixed culture Gravel Top | <3 | 541 | 430 | 3 |
| Raglan Mixed culture Gravel Bottom | 4 | 521 | 384 | <1 |
| Arrieros/LB Control Soil | <3 | 208 | 343 | 9 |
| Arrieros/LB Mixed culture (no meth) Soil | <3 | 178 | 296 | <1 |
| Arrieros/LB Methanotroph Soil | <3 | 215 | 268 | <1 |
| Arrieros/LB S-oxidizer Soil | <3 | 147 | 319 | <1 |
| Arrieros/LB Control Soil | <3 | 160 | 311 | <1 |
| Arrieros/LB Mixed culture (with meth) Soil | <3 | 522 | 434 | <1 |
| Arrieros/LB Control Gravel Top | <3 | 1425 | 321 | 2 |
| Arrieros/LB Control Gravel Bottom | <3 | 1912 | 369 | 2 |
| Arrieros/LB Mixed culture (with meth) Gravel Top | <3 | 796 | 251 | 2 |
| Arrieros/LB Mixed culture (with meth) Gravel Bottom | <3 | 1109 | 278 | <1 |
| Talbot/T7 Mixed culture Soil | <3 | 9 | 51 | <1 |
| Talbot/T7 Mixed culture Soil | <3 | 10 | 11 | <1 |
| Talbot/T7 Mixed culture Soil | <3 | 11 | <10 | <1 |
| Talbot/T7 Control Soil | <3 | 6 | 48 | <1 |
| Talbot/T7 Control Soil | <3 | 11 | <10 | <1 |
| Talbot/T7 Control Soil | <3 | 10 | 33 | <1 |

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) |
|---|---|---|---|---|
| 0.1M Hydroxylamine-HCl | | | | |
| Raglan Control Soil | <3 | 775 | 348 | 2 |
| Raglan Control Gravel Top | 8 | 1237 | 239 | <1 |
| Raglan Control Gravel Bottom | 5 | 1050 | 290 | <1 |
| Raglan Mixed culture Soil | 6 | 1915 | 529 | 4 |
| Raglan Mixed culture Gravel Top | 20 | 999 | 288 | 2 |
| Raglan Mixed culture Gravel Bottom | 9 | 1058 | 313 | <1 |
| Arrieros/LB Control Soil | 14 | 1125 | 3747 | <1 |
| Arrieros/LB Mixed culture (no meth) Soil | 11 | 1002 | 3183 | <1 |
| Arrieros/LB Methanotroph Soil | 11 | 1186 | 3805 | <1 |
| Arrieros/LB S-oxidizer Soil | 15 | 1227 | 4005 | <1 |
| Arrieros/LB Control Soil | 12 | 1157 | 3754 | <1 |
| Arrieros/LB Mixed culture (with meth) Soil | 9 | 1176 | 4045 | <1 |
| Arrieros/LB Control Gravel Top | 4 | 351 | 1153 | <1 |
| Arrieros/LB Control Gravel Bottom | 7 | 300 | 1045 | <1 |
| Arrieros/LB Mixed culture (with meth) Gravel Top | <3 | 288 | 1231 | <1 |
| Arrieros/LB Mixed culture (with meth) Gravel Bottom | <3 | 249 | 1801 | <1 |

| Ba (ppb) | Be (ppb) | Bi (ppb) | Br (ppb) | Cd (ppb) | Ce (ppb) | Cl (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Na-pyrophosphate | | | | | | | | | |
| 6753 | <20 | 20 | | 31 | 14363 | | 2164 | 70 | 13729 |
| 3391 | 33 | 9 | | <20 | 3596 | | 3639 | 125 | 5107 |
| 2683 | <20 | 8 | | <20 | 2623 | | 4479 | 112 | 4531 |
| 6078 | 110 | 15 | | <20 | 13152 | | 2439 | 55 | 14577 |
| 2227 | <20 | 7 | | <20 | 2615 | | 999 | 75 | 2745 |
| 1998 | <20 | 6 | | <20 | 2192 | | 2302 | 83 | 3301 |
| 537 | <20 | <5 | | <20 | 297 | | 59 | 83 | 931 |
| 653 | <20 | <5 | | <20 | 197 | | 40 | 72 | 1140 |
| 692 | <20 | <5 | | <20 | 213 | | 42 | 77 | 1164 |
| 704 | 31 | <5 | | <20 | 184 | | 30 | 59 | 1231 |
| 551 | <20 | <5 | | <20 | 299 | | 37 | 59 | 935 |
| 1062 | <20 | 23 | | <20 | 464 | | 89 | 126 | 6559 |
| 1712 | <20 | 8 | | <20 | 752 | | 151 | 155 | 1412 |
| 2105 | <20 | 32 | | <20 | 1050 | | 224 | 199 | 3745 |
| 947 | <20 | 6 | | <20 | 526 | | 96 | 94 | 1713 |
| 1387 | <20 | 13 | | <20 | 774 | | 138 | 126 | 5107 |
| 664 | <20 | <5 | | 35 | | | 15 | | 24 |
| 719 | <20 | <5 | | 34 | | | 16 | | 20 |
| 664 | <20 | <5 | | 34 | | | 15 | | 19 |
| 631 | <20 | <5 | | 38 | | | 15 | | 18 |
| 899 | <20 | <5 | | 37 | | | 16 | | 19 |
| 775 | <20 | <5 | | 37 | | | 15 | | 21 |

| Ba (ppb) | Be (ppb) | Bi (ppb) | Br (ppb) | Cd (ppb) | Ce (ppb) | Cl (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Hydroxylamine-HCl | | | | | | | | | |
| 21712 | 59 | <5 | | 121 | 1749 | | 15921 | 7 | 2301 |
| 7792 | 40 | <5 | | 67 | 10373 | | 12130 | 15 | 17053 |
| 5693 | 79 | <5 | | 67 | 8561 | | 10155 | 22 | 17743 |
| 18699 | <20 | <5 | | 101 | 4202 | | 16326 | 49 | 7802 |
| 6509 | 59 | <5 | | 62 | 8729 | | 8015 | 20 | 8570 |
| 5265 | 39 | <5 | | 66 | 8513 | | 7112 | 17 | 13106 |
| 29412 | 236 | <5 | | 66 | 9268 | | 2813 | 29 | 4821 |
| 26188 | 158 | <5 | | 57 | 7872 | | 2455 | 32 | 3965 |
| 29130 | 138 | <5 | | 75 | 9298 | | 2735 | 44 | 4837 |
| 31586 | 79 | <5 | | 87 | 9949 | | 2969 | 40 | 5137 |
| 31127 | 137 | <5 | | 68 | 9235 | | 2880 | 35 | 4738 |
| 30088 | 216 | <5 | | 79 | 10029 | | 2793 | 35 | 18447 |
| 13626 | 53 | <5 | | <20 | 3553 | | 1457 | 26 | 1295 |
| 20257 | 167 | <5 | | 42 | 4658 | | 4686 | 25 | 9755 |
| 19989 | 91 | <5 | | <20 | 4627 | | 1223 | 32 | 5273 |
| 11098 | 73 | 6 | | <20 | 4312 | | 1153 | 29 | 19885 |

| Dy (ppb) | Er (ppb) | Eu (ppb) | Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Na-pyrophosphate | | | | | | | | | |
| 479 | 278 | 201 | 352 | 756 | <50 | 187 | <5 | 97 | <10 |
| 104 | 71 | 38 | 443 | 159 | <50 | 109 | <5 | <20 | <10 |
| 75 | 37 | 27 | 374 | 110 | <50 | 68 | <5 | <20 | <10 |
| 449 | 228 | 166 | 299 | 644 | <50 | 181 | <5 | 78 | <10 |
| 61 | 37 | 26 | 233 | 103 | <50 | 71 | <5 | <20 | <10 |
| 62 | 35 | 21 | 227 | 92 | <50 | 56 | <5 | <20 | <10 |
| 34 | 16 | 11 | 63 | 21 | <50 | <20 | <5 | <20 | <10 |
| 21 | 16 | <5 | <50 | 45 | <50 | <20 | <5 | <20 | <10 |
| 15 | 17 | <5 | 59 | 48 | <50 | <20 | <5 | <20 | <10 |
| 14 | 6 | 7 | <50 | 46 | <50 | <20 | <5 | <20 | <10 |
| 24 | 15 | <5 | <50 | 14 | <50 | <20 | <5 | <20 | <10 |
| 39 | 20 | 8 | 185 | 68 | <50 | <20 | <5 | <20 | <10 |
| 39 | 16 | 14 | 442 | 64 | <50 | <20 | <5 | <20 | <10 |
| 43 | 25 | 15 | 575 | 81 | <50 | 25 | <5 | <20 | <10 |
| 19 | 7 | 9 | 263 | 22 | <50 | <20 | <5 | <20 | <10 |
| 19 | 11 | 8 | 377 | 47 | <50 | <20 | <5 | <20 | <10 |

| Dy (ppb) | Er (ppb) | Eu (ppb) | Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Hydroxylamine-HCl | | | | | | | | | |
| 58 | 29 | 13 | <20 | 91 | <50 | <20 | <5 | <20 | <10 |
| 332 | 171 | 112 | 51 | 533 | <50 | <20 | <5 | 59 | <10 |
| 270 | 142 | 94 | 51 | 425 | <50 | <20 | <5 | 55 | <10 |
| 151 | 72 | 40 | 109 | 231 | <50 | <20 | <5 | 32 | <10 |
| 266 | 148 | 93 | 60 | 453 | <50 | <20 | <5 | 51 | <10 |
| 310 | 129 | 93 | 59 | 481 | <50 | <20 | <5 | 54 | <10 |
| 494 | 250 | 123 | 51 | 758 | <50 | <20 | <5 | 92 | <10 |
| 431 | 211 | 95 | 47 | 621 | <50 | <20 | <5 | 84 | <10 |
| 482 | 250 | 118 | 52 | 739 | <50 | <20 | <5 | 96 | <10 |
| 516 | 269 | 120 | 38 | 806 | <50 | <20 | <5 | 100 | <10 |
| 504 | 258 | 118 | 46 | 696 | <50 | <20 | <5 | 93 | <10 |
| 526 | 242 | 127 | 48 | 749 | <50 | <20 | <5 | 98 | <10 |
| 220 | 96 | 46 | 27 | 300 | <50 | <20 | <5 | 39 | <10 |
| 238 | 116 | 60 | <20 | 356 | <50 | <20 | <5 | 46 | <10 |
| 220 | 109 | 53 | <20 | 364 | <50 | <20 | <5 | 45 | <10 |
| 235 | 106 | 54 | <20 | 331 | <50 | <20 | <5 | 40 | <10 |

| La (ppb) | Li (ppb) | Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) | Rb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Na-pyrophosphate | | | | | | | | | |
| 14341 | 246 | 39 | 276 | 174 | 6609 | 104024 | 1849 | 1776 | 864 |
| 3226 | 562 | 9 | 158 | 120 | 1478 | 95010 | 604 | 397 | 1584 |
| 2245 | 354 | 7 | 117 | 100 | 1110 | 121562 | 491 | 293 | 1291 |
| 13124 | 124 | 34 | 246 | 192 | 5879 | 112361 | 1708 | 1656 | 688 |
| 2351 | 401 | 6 | 136 | 84 | 1065 | 24388 | 419 | 289 | 972 |
| 1855 | 327 | <5 | 111 | 75 | 868 | 65355 | 350 | 236 | 988 |
| 461 | 230 | <5 | 30 | 12 | 237 | 427 | 93 | 55 | 246 |
| 376 | 260 | <5 | 30 | <10 | 193 | 187 | 98 | 36 | 227 |
| 387 | 272 | <5 | 20 | 15 | 243 | 176 | 83 | 101 | 256 |
| 346 | 265 | <5 | 29 | <10 | 178 | 196 | 72 | 41 | 199 |
| 309 | 233 | <5 | 14 | 10 | 164 | 115 | 78 | 40 | 215 |
| 542 | 502 | <5 | 56 | 16 | 299 | 261 | 244 | 84 | 428 |
| 839 | 1164 | <5 | 21 | 24 | 344 | 163 | 649 | 88 | 747 |
| 1102 | 1324 | <5 | 45 | 28 | 437 | 343 | 792 | 123 | 1055 |
| 510 | 558 | <5 | 28 | 15 | 205 | 162 | 410 | 47 | 473 |
| 655 | 688 | <5 | 57 | 18 | 227 | 145 | 524 | 65 | 635 |
| | | | | | | 22 | | | |
| | | | | | | 19 | | | |
| | | | | | | 18 | | | |
| | | | | | | 20 | | | |
| | | | | | | 22 | | | |
| | | | | | | 17 | | | |

| La (ppb) | Li (ppb) | Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) | Rb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Hydroxylamine-HCl | | | | | | | | | |
| 1831 | 1053 | <5 | <10 | <10 | 659 | 544772 | 2435 | 189 | 450 |
| 5843 | 1936 | 18 | <10 | <10 | 3726 | 193129 | 4457 | 955 | 691 |
| 4472 | 1477 | 15 | <10 | <10 | 3057 | 184369 | 3913 | 801 | 662 |
| 3415 | 2166 | 6 | <10 | <10 | 1500 | 530022 | 4617 | 466 | 1537 |
| 4402 | 1406 | 13 | <10 | <10 | 2902 | 113229 | 3914 | 784 | 676 |
| 4420 | 1415 | 15 | <10 | <10 | 3194 | 131720 | 3524 | 811 | 662 |
| 4103 | 4260 | 31 | 18 | <10 | 3471 | 1969 | 4776 | 849 | 430 |
| 3397 | 4017 | 23 | 16 | <10 | 2867 | 1307 | 4154 | 693 | 433 |
| 4038 | 4359 | 27 | 20 | <10 | 3310 | 1181 | 4991 | 818 | 457 |
| 4302 | 4757 | 29 | 20 | <10 | 3820 | 1355 | 5389 | 915 | 480 |
| 3918 | 4669 | 27 | 15 | <10 | 3404 | 1128 | 4902 | 806 | 474 |
| 4447 | 5061 | 33 | 26 | <10 | 3846 | 1449 | 8626 | 929 | 469 |
| 1266 | 1256 | 11 | 38 | <10 | 1327 | 623 | 5991 | 301 | 235 |
| 1549 | 1175 | 11 | 19 | <10 | 1484 | 999 | 8736 | 364 | 355 |
| 1503 | 1253 | 14 | 30 | <10 | 1607 | 717 | 5731 | 369 | 246 |
| 1303 | 679 | 9 | 52 | <10 | 1373 | 644 | 4529 | 328 | 270 |

| Re (ppb) | S (ppm) | Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) | Ta (ppb) | Tb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Na-pyrophosphate | | | | | | | | | |
| <2 | | 21 | 2273 | 425 | 996 | 55 | 491 | <20 | 100 |
| <2 | | 13 | 1212 | <200 | 245 | 33 | 237 | <20 | 19 |
| <2 | | 7 | 983 | <200 | 150 | <20 | 186 | <20 | 14 |
| <2 | | 11 | 2080 | <200 | 974 | 43 | 428 | <20 | 97 |
| <2 | | <5 | 825 | <200 | 163 | 20 | 167 | <20 | 14 |
| <2 | | 9 | 773 | <200 | 134 | <20 | 130 | <20 | 7 |
| <2 | | <5 | 269 | <200 | 47 | <20 | 752 | <20 | <5 |
| <2 | | <5 | 233 | <200 | 32 | <20 | 756 | <20 | <5 |
| <2 | | <5 | 290 | <200 | 39 | <20 | 835 | <20 | <5 |
| <2 | | <5 | 205 | <200 | 42 | <20 | 809 | <20 | <5 |
| <2 | | <5 | 204 | <200 | 49 | <20 | 744 | <20 | <5 |
| <2 | | 11 | 688 | <200 | 83 | <20 | 826 | <20 | 5 |
| <2 | | <5 | 1827 | <200 | 57 | <20 | 426 | <20 | 8 |
| <2 | | 20 | 2285 | <200 | 86 | 51 | 442 | <20 | 8 |
| <2 | | <5 | 991 | <200 | 36 | <20 | 252 | <20 | 6 |
| <2 | | 8 | 1324 | <200 | 44 | 23 | 280 | <20 | 5 |
| | 3.4 | 5 | | <200 | | | 51 | | |
| | 3.4 | 7 | | <200 | | | 49 | | |
| | 2.5 | 10 | | <200 | | | 58 | | |
| | 3.9 | 20 | | <200 | | | 43 | | |
| | 3.1 | 8 | | <200 | | | 53 | | |
| | 2.8 | 18 | | <200 | | | 56 | | |

| Re (ppb) | S (ppm) | Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) | Ta (ppb) | Tb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Hydroxylamine-HCl | | | | | | | | | |
| <2 | | <5 | 191 | <200 | 87 | <20 | 1518 | <20 | 13 |
| <2 | | <5 | 226 | <200 | 624 | <20 | 3079 | <20 | 66 |
| <2 | | <5 | 182 | <200 | 545 | <20 | 2547 | <20 | 52 |
| <2 | | <5 | 367 | <200 | 209 | <20 | 1792 | <20 | 31 |
| <2 | | <5 | 191 | <200 | 508 | <20 | 2629 | <20 | 52 |
| <2 | | <5 | 192 | <200 | 551 | <20 | 2803 | <20 | 62 |
| <2 | | <5 | 263 | <200 | 712 | <20 | 8613 | <20 | 97 |
| <2 | | <5 | 212 | <200 | 624 | <20 | 8305 | <20 | 85 |
| <2 | | <5 | 240 | <200 | 742 | <20 | 9152 | <20 | 96 |
| <2 | | <5 | 274 | <200 | 812 | <20 | 10114 | <20 | 100 |
| <2 | | <5 | 236 | <200 | 727 | <20 | 9988 | <20 | 94 |
| <2 | | <5 | 281 | <200 | 803 | <20 | 10183 | <20 | 103 |
| <2 | | <5 | 134 | <200 | 282 | <20 | 2046 | <20 | 41 |
| <2 | | <5 | <100 | <200 | 316 | <20 | 3001 | <20 | 47 |
| <2 | | <5 | <100 | <200 | 354 | <20 | 2389 | <20 | 47 |
| <2 | | <5 | <100 | <200 | 285 | <20 | 1270 | <20 | 43 |

| Te (ppb) | Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) | Y (ppb) | Yb (ppb) | Zn (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Na-pyrophosphate | | | | | | | | | |
| <20 | 5032 | 45 | 34 | 249 | 5481 | <10 | 2891 | 250 | 2711 |
| <20 | 1765 | 30 | 9 | 130 | 2179 | 10 | 633 | 68 | 3023 |
| <20 | 1451 | 28 | <5 | 105 | 1767 | <10 | 468 | 47 | 2513 |
| <20 | 4748 | 52 | 27 | 212 | 5408 | 28 | 2605 | 179 | 2500 |
| <20 | 1206 | 25 | 5 | 91 | 1518 | <10 | 445 | 37 | 1927 |
| <20 | 1130 | 19 | <5 | 89 | 1393 | 12 | 373 | 35 | 1891 |
| <20 | 182 | 4 | <5 | 8 | 282 | <10 | 213 | 5 | 519 |
| <20 | 146 | 7 | <5 | 7 | 230 | 16 | 184 | <5 | 381 |
| <20 | 177 | 8 | <5 | 8 | 293 | <10 | 197 | 16 | 519 |
| <20 | 178 | 5 | <5 | 7 | 245 | 20 | 197 | 11 | 404 |
| <20 | 147 | 1 | <5 | 6 | 206 | <10 | 181 | 6 | 488 |
| <20 | 292 | 5 | <5 | 13 | 522 | 28 | 261 | 9 | 894 |
| <20 | 349 | 17 | <5 | 11 | 908 | 19 | 249 | 12 | 1486 |
| <20 | 571 | 8 | <5 | 18 | 1177 | 29 | 295 | 37 | 2015 |
| <20 | 236 | 7 | <5 | 8 | 629 | 13 | 137 | 11 | 773 |
| <20 | 493 | 8 | <5 | 12 | 775 | 17 | 163 | 7 | 1126 |
| | | | | | 116 | | | | 590 |
| | | | | | 136 | | | | 317 |
| | | | | | 107 | | | | 440 |
| | | | | | 100 | | | | 342 |
| | | | | | 144 | | | | 376 |
| | | | | | 120 | | | | 405 |

| Te (ppb) | Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) | Y (ppb) | Yb (ppb) | Zn (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.1M Hydroxylamine-HCl | | | | | | | | | |
| <20 | <20 | 2 | <5 | 21 | 2469 | <10 | 356 | 23 | 12930 |
| <20 | <20 | 2 | 22 | 59 | 4845 | <10 | 1768 | 115 | 11817 |
| <20 | <20 | 2 | 16 | 62 | 3868 | <10 | 1456 | 99 | 9381 |
| <20 | 22 | 5 | 7 | 39 | 5184 | <10 | 782 | 54 | 19558 |
| <20 | <20 | 2 | 18 | 64 | 3664 | <10 | 1503 | 105 | 9063 |
| <20 | <20 | 2 | 16 | 64 | 3966 | <10 | 1557 | 116 | 9217 |
| <20 | 40 | 2 | 34 | 172 | 3537 | <10 | 2697 | 215 | 4161 |
| <20 | 32 | 2 | 26 | 148 | 3001 | <10 | 2405 | 185 | 3694 |
| <20 | 33 | 3 | 29 | 171 | 3655 | <10 | 2777 | 186 | 4218 |
| <20 | 32 | 2 | 34 | 177 | 3904 | <10 | 2986 | 221 | 4640 |
| <20 | 34 | 2 | 30 | 166 | 3557 | <10 | 2669 | 210 | 4289 |
| <20 | 29 | 2 | 34 | 189 | 4125 | <10 | 2905 | 207 | 4969 |
| <20 | 83 | 2 | 14 | 107 | 2610 | <10 | 1079 | 73 | 2452 |
| <20 | 23 | 1 | 14 | 112 | 3541 | <10 | 1239 | 86 | 2972 |
| <20 | 20 | 1 | 14 | 96 | 2612 | <10 | 1305 | 92 | 2399 |
| <20 | <20 | 1 | 14 | 74 | 2529 | <10 | 1127 | 74 | 1847 |

| Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) | Na (ppm) | P (ppm) | Tl (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.1M Na-pyrophosphate | | | | | | | | |
| 6155 | 128 | 2440 | 111 | 154 | 30186 | | | 8 |
| 3117 | 10 | 1259 | 207 | 176 | 12840 | | | 12 |
| 2384 | 8 | 1060 | 173 | 146 | 8704 | | | 10 |
| 6092 | 111 | 2312 | 78 | 125 | 23066 | | | 6 |
| 2149 | 8 | 773 | 126 | 103 | 10111 | | | 8 |
| 2107 | 8 | 817 | 123 | 108 | 6942 | | | 8 |
| 235 | 134 | 81 | 78 | 57 | 3038 | | | <5 |
| 390 | 115 | 55 | 68 | 47 | 2359 | | | <5 |
| 267 | 137 | 78 | 79 | 60 | 3053 | | | <5 |
| 194 | 136 | 53 | 65 | 41 | 2684 | | | <5 |
| 222 | 102 | 53 | 65 | 46 | 2742 | | | <5 |
| 448 | 124 | 208 | 123 | 122 | 5429 | | | <5 |
| 429 | 66 | 559 | 155 | 319 | 11011 | | | 5 |
| 572 | 69 | 730 | 199 | 428 | 15340 | | | 8 |
| 346 | 52 | 328 | 94 | 181 | 6603 | | | <5 |
| 350 | 52 | 429 | 126 | 242 | 9076 | | | 6 |
| | 45 | 11 | 20 | 25 | 1926 | | | 0.013 |
| | 32 | 14 | 20 | 15 | 2111 | | | |
| | 42 | 12 | 19 | 22 | 1761 | | | 0.024 |
| | 48 | 10 | 17 | 28 | 1893 | | | 0.003 |
| | 39 | 15 | 23 | 20 | 2591 | | | 0.004 |
| | 41 | 13 | 21 | 22 | 2076 | | | |

| Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) | Na (ppm) | P (ppm) | Tl (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.1M Hydroxylamine-HCl | | | | | | | | |
| 67 | 253 | 2880 | 80 | 717 | 38371 | | 340 | 10 |
| <20 | 922 | 2565 | 97 | 833 | 96769 | | 384 | 7 |
| <20 | 744 | 2435 | 90 | 760 | 68928 | | 335 | 8 |
| 178 | 398 | 4464 | 153 | 1288 | 58404 | | 623 | 22 |
| <20 | 769 | 1833 | 78 | 586 | 98773 | | 345 | 9 |
| <20 | 795 | 2212 | 91 | 708 | 62637 | | 351 | 6 |
| <20 | 995 | 426 | 289 | 762 | 234418 | | 392 | 24 |
| <20 | 925 | 372 | 257 | 664 | 198177 | | 319 | 34 |
| <20 | 977 | 450 | 296 | 809 | 239750 | | 386 | 27 |
| <20 | 1131 | 467 | 313 | 855 | 262994 | | 422 | 38 |
| <20 | 961 | 460 | 292 | 811 | 238331 | | 375 | 34 |
| <20 | 1041 | 589 | 311 | 858 | 241041 | | 425 | 27 |
| <20 | 673 | 283 | 84 | 181 | 134772 | | 643 | 9 |
| <20 | 696 | 356 | 81 | 168 | 245275 | | 356 | 36 |
| <20 | 735 | 323 | 75 | 166 | 144663 | | 341 | 9 |
| <20 | 495 | 274 | 73 | 119 | 103879 | | 256 | 6 |

| | Ag (ppb) | Al (ppm) | As (ppb) | Au (ppb) |
|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl | | | | |
| Raglan Control Soil | 6 | 648 | 207 | <1 |
| Raglan Control Gravel Top | 19 | 469 | 184 | <1 |
| Raglan Control Gravel Bottom | 11 | 438 | <100 | <1 |
| Raglan Mixed culture Soil | 25 | 983 | 298 | <1 |
| Raglan Mixed culture Gravel Top | 22 | 455 | <100 | <1 |
| Raglan Mixed culture Gravel Bottom | 16 | 438 | 104 | <1 |
| Arrieros/LB Control Soil | 8 | 416 | 1423 | <1 |
| Arrieros/LB Mixed culture (no meth) Soil | 6 | 381 | 1296 | <1 |
| Arrieros/LB Methanotroph Soil | 5 | 425 | 1306 | <1 |
| Arrieros/LB S-oxidizer Soil | 10 | 444 | 1593 | <1 |
| Arrieros/LB Control Soil | 8 | 435 | 1543 | <1 |
| Arrieros/LB Mixed culture (with meth) Soil | 21 | 423 | 1443 | <1 |
| Arrieros/LB Control Gravel Top | <3 | 152 | 296 | 4 |
| Arrieros/LB Control Gravel Bottom | 7 | 173 | 364 | 4 |
| Arrieros/LB Mixed culture (with meth) Gravel Top | 5 | 163 | 338 | 5 |
| Arrieros/LB Mixed culture (with meth) Gravel Bottom | 6 | 134 | 283 | 2 |

| | Ag (ppb) | Al (%) | As (ppm) | Au (ppb) |
|---|---|---|---|---|
| Aqua Regia | | | | |
| Raglan Control Soil | 112 | 1.65 | 6 | 0.5 |
| Raglan Control Gravel Top | 95 | 1.28 | 4 | 1.4 |
| Raglan Control Gravel Bottom | 117 | 1.27 | 4 | 0.7 |
| Raglan Mixed culture Soil | 126 | 1.46 | 5 | 2.6 |
| Raglan Mixed culture Gravel Top | 97 | 1.27 | 51 | 0.7 |
| Raglan Mixed culture Gravel Bottom | 86 | 1.18 | 3 | 0.5 |
| Arrieros/LB Control Soil | 34 | 1.22 | 26 | <0.2 |
| Arrieros/LB Mixed culture (no meth) Soil | 34 | 1.26 | 28 | <0.2 |
| Arrieros/LB Methanotroph Soil | 41 | 1.28 | 26 | <0.2 |
| Arrieros/LB S-oxidizer Soil | 55 | 1.23 | 26 | <0.2 |
| Talbot/T7 Control Soil | 21 | 0.84 | 1 | <0.2 |
| Talbot/T7 Control Soil | 32 | 1.25 | 2 | <0.2 |
| Talbot/T7 Control Soil | 35 | 1.04 | 2 | 0.2 |
| Talbot/T7 Mixed culture Soil | 36 | 0.81 | 2 | 1.9 |
| Talbot/T7 Mixed culture Soil | 49 | 1.14 | 3 | 0.6 |
| Talbot/T7 Mixed culture Soil | 62 | 0.96 | 3 | 1.8 |

| Ba (ppb) | Be (ppb) | Bi (ppb) | Br (ppb) | Cd (ppb) | Ce (ppb) | Cl (ppb) | Co (ppb) | Cs (ppb) | Cu (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl | | | | | | | | | |
| 5557 | 32 | <5 | | <20 | 1464 | | 3644 | 33 | 819 |
| 2450 | <20 | <5 | | <20 | 2856 | | 2093 | 41 | 5090 |
| 1745 | <20 | <5 | | <20 | 2053 | | 1651 | 51 | 4514 |
| 3884 | <20 | <5 | | <20 | 1437 | | 3138 | 136 | 1267 |
| 2185 | <20 | <5 | | <20 | 2039 | | 1609 | 59 | 5099 |
| 1802 | 67 | <5 | | <20 | 1865 | | 1507 | 50 | 5103 |
| 10304 | 34 | <5 | | <20 | 3605 | | 516 | 42 | 3452 |
| 9964 | 69 | <5 | | <20 | 3214 | | 436 | 44 | 2909 |
| 11458 | <20 | 6 | | <20 | 3524 | | 535 | 61 | 3621 |
| 13573 | 70 | <5 | | <20 | 3838 | | 564 | 45 | 3998 |
| 12509 | 70 | <5 | | 20 | 3508 | | 508 | 44 | 3529 |
| 11493 | <20 | 6 | | <20 | 3599 | | 525 | 50 | 7661 |
| 1660 | 52 | 10 | | <20 | 1713 | | 228 | 53 | 1689 |
| 5350 | 87 | 15 | | 22 | 2590 | | 1453 | 58 | 8191 |
| 3226 | 28 | 12 | | <20 | 2835 | | 252 | 63 | 2648 |
| 1925 | 30 | 12 | | <20 | 2321 | | 224 | 61 | 6391 |

| Ba (ppm) | Be (ppb) | Bi (ppm) | Br (ppb) | Cd (ppm) | Ce (ppb) | Cl (ppb) | Co (ppm) | Cs (ppb) | Cu (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| Aqua Regia | | | | | | | | | |
| 77 | | 0.14 | | 0.30 | | | 39.3 | | 155 |
| 51 | | 0.08 | | 0.21 | | | 31.8 | | 238 |
| 46 | | 0.07 | | 0.17 | | | 35.2 | | 347 |
| 68 | | 0.12 | | 0.28 | | | 37.1 | | 208 |
| 53 | | 0.08 | | 0.30 | | | 23.9 | | 91 |
| 40 | | 0.09 | | 0.16 | | | 23.6 | | 198 |
| 134 | | 0.26 | | 0.22 | | | 9.9 | | 36 |
| 126 | | 0.24 | | 0.23 | | | 9.0 | | 36 |
| 124 | | 0.25 | | 0.24 | | | 9.8 | | 40 |
| 120 | | 0.28 | | 0.22 | | | 9.5 | | 34 |
| 38 | | 0.11 | | 0.05 | | | 7.1 | | 7 |
| 57 | | 0.18 | | 0.10 | | | 9.6 | | 13 |
| 50 | | 0.15 | | 0.15 | | | 11.3 | | 18 |
| 41 | | 0.11 | | 0.13 | | | 8.1 | | 11 |
| 51 | | 0.13 | | 0.30 | | | 10.5 | | 26 |
| 40 | | 0.11 | | 0.41 | | | 9.2 | | 55 |

| Dy (ppb) | Er (ppb) | Eu (ppb) | Ga (ppb) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl | | | | | | | | | |
| 36 | 21 | 13 | 43 | 67 | <50 | <20 | 8 | <20 | <10 |
| 52 | 33 | 25 | 36 | 119 | <50 | <20 | <5 | <20 | <10 |
| 38 | 27 | 20 | 45 | 75 | <50 | <20 | <5 | <20 | <10 |
| 32 | 14 | 16 | 101 | 81 | <50 | <20 | 6 | <20 | <10 |
| 51 | 18 | 16 | 46 | 77 | <50 | <20 | 9 | <20 | <10 |
| 49 | 28 | 20 | 49 | 77 | <50 | <20 | 6 | <20 | <10 |
| 129 | 64 | 28 | 27 | 154 | <50 | <20 | <5 | 23 | <10 |
| 121 | 59 | 28 | 27 | 148 | <50 | <20 | <5 | <20 | <10 |
| 123 | 62 | 27 | 29 | 159 | <50 | <20 | <5 | 24 | <10 |
| 134 | 69 | 34 | 25 | 214 | <50 | <20 | <5 | 30 | <10 |
| 127 | 59 | 27 | 25 | 187 | <50 | <20 | <5 | 22 | <10 |
| 149 | 74 | 34 | 25 | 168 | <50 | <20 | <5 | 27 | <10 |
| 95 | 50 | 21 | <20 | 119 | <50 | <20 | <5 | <20 | <10 |
| 130 | 69 | 32 | <20 | 201 | <50 | <20 | <5 | 27 | <10 |
| 136 | 70 | 30 | <20 | 180 | <50 | <20 | <5 | 25 | <10 |
| 112 | 46 | 28 | <20 | 171 | <50 | <20 | <5 | <20 | <10 |

| Dy (ppb) | Er (ppb) | Eu (ppb) | Ga (ppm) | Gd (ppb) | Ge (ppb) | Hf (ppb) | Hg (ppb) | Ho (ppb) | In (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Aqua Regia | | | | | | | | | |
| | | | 5.3 | | | | 96 | | |
| | | | 4.4 | | | | 23 | | |
| | | | 4.3 | | | | 22 | | |
| | | | 4.6 | | | | 91 | | |
| | | | 4.3 | | | | 76 | | |
| | | | 4.0 | | | | 21 | | |
| | | | 4.1 | | | | 15 | | |
| | | | 4.0 | | | | 13 | | |
| | | | 4.2 | | | | 12 | | |
| | | | 4.3 | | | | 14 | | |
| | | | 3.1 | | | | 9 | | |
| | | | 4.6 | | | | 16 | | |
| | | | 3.9 | | | | 14 | | |
| | | | 2.6 | | | | <5 | | |
| | | | 3.7 | | | | 20 | | |
| | | | 3.1 | | | | 20 | | |

| La (ppb) | Li (ppb) | Lu (ppb) | Mo (ppb) | Nb (ppb) | Nd (ppb) | Ni (ppb) | Pb (ppb) | Pr (ppb) | Rb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl | | | | | | | | | |
| 1407 | 2023 | <5 | 13 | <10 | 582 | 107058 | 670 | 164 | 982 |
| 1356 | 1618 | <5 | 74 | 17 | 827 | 20990 | 651 | 234 | 931 |
| 1037 | 1353 | <5 | 66 | 19 | 680 | 17941 | 317 | 177 | 886 |
| 1076 | 2313 | <5 | 33 | 25 | 590 | 62989 | <20 | 149 | 2496 |
| 977 | 1238 | <5 | 55 | 21 | 601 | 13296 | 327 | 166 | 984 |
| 949 | 1242 | <5 | 87 | 16 | 644 | 15920 | 354 | 164 | 912 |
| 1172 | 3241 | 9 | 183 | 13 | 934 | 853 | 914 | 230 | 589 |
| 1002 | 2701 | 5 | 138 | 10 | 802 | 829 | 561 | 199 | 576 |
| 1185 | 3393 | 7 | 173 | 15 | 917 | 811 | 1115 | 227 | 616 |
| 1428 | 3325 | 9 | 199 | 33 | 1105 | 930 | 1421 | 272 | 614 |
| 1163 | 3259 | 6 | 181 | 16 | 931 | 856 | 1054 | 243 | 598 |
| 1312 | 3194 | 6 | 190 | 22 | 945 | 825 | 2056 | 259 | 617 |
| 757 | 1161 | 6 | 62 | <10 | 625 | 313 | 1112 | 155 | 351 |
| 1090 | 1207 | 11 | 109 | <10 | 884 | 537 | 4707 | 224 | 486 |
| 922 | 1004 | 7 | 88 | <10 | 827 | 354 | 1088 | 187 | 336 |
| 817 | 793 | 6 | 97 | <10 | 730 | 373 | 962 | 174 | 316 |

| La (ppm) | Li (ppb) | Lu (ppb) | Mo (ppm) | Nb (ppb) | Nd (ppb) | Ni (ppm) | Pb (ppm) | Pr (ppb) | Rb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Aqua Regia | | | | | | | | | |
| 27.2 | | | 1.53 | | | 1198 | 15.8 | | |
| 22.2 | | | 1.17 | | | 568 | 10.0 | | |
| 21.2 | | | 1.12 | | | 727 | 9.5 | | |
| 26.6 | | | 1.29 | | | 1123 | 14.1 | | |
| 26.9 | | | 3.98 | | | 442 | 12.0 | | |
| 18.9 | | | 1.00 | | | 508 | 9.5 | | |
| 16.0 | | | 1.76 | | | 12 | 15.3 | | |
| 16.1 | | | 1.62 | | | 11 | 13.9 | | |
| 16.3 | | | 1.59 | | | 13 | 15.0 | | |
| 17.2 | | | 1.54 | | | 11 | 18.6 | | |
| 9.4 | | | 0.22 | | | 13 | 8.4 | | |
| 13.3 | | | 0.26 | | | 18 | 12.7 | | |
| 10.8 | | | 0.31 | | | 15 | 11.7 | | |
| 8.2 | | | 0.26 | | | 12 | 8.2 | | |
| 10.6 | | | 0.31 | | | 16 | 10.7 | | |
| 8.2 | | | 0.21 | | | 14 | 8.3 | | |

| Re (ppb) | S (ppm) | Sb (ppb) | Sc (ppb) | Se (ppb) | Sm (ppb) | Sn (ppb) | Sr (ppb) | Ta (ppb) | Tb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl | | | | | | | | | |
| <2 | | <5 | 385 | <200 | 71 | <20 | 281 | <20 | 7 |
| <2 | | <5 | 262 | <200 | 142 | <20 | 282 | <20 | 11 |
| <2 | | <5 | 264 | <200 | 116 | <20 | 263 | <20 | 5 |
| <2 | | <5 | 491 | <200 | 101 | <20 | 299 | <20 | 5 |
| <2 | | <5 | 239 | <200 | 86 | <20 | 295 | <20 | 10 |
| <2 | | <5 | 222 | <200 | 100 | <20 | 279 | <20 | 8 |
| <2 | | <5 | 345 | <200 | 211 | <20 | 4920 | <20 | 19 |
| <2 | | <5 | 298 | <200 | 163 | <20 | 4571 | <20 | 19 |
| <2 | | <5 | 359 | <200 | 204 | <20 | 5157 | <20 | 25 |
| <2 | | <5 | 380 | <200 | 215 | <20 | 5803 | <20 | 31 |
| <2 | | <5 | 329 | <200 | 201 | <20 | 5400 | <20 | 21 |
| <2 | | <5 | 356 | <200 | 215 | <20 | 5625 | <20 | 25 |
| <2 | | <5 | 141 | <200 | 122 | <20 | 920 | <20 | 16 |
| <2 | | <5 | 143 | <200 | 199 | <20 | 1425 | <20 | 27 |
| <2 | | <5 | 129 | <200 | 186 | <20 | 963 | <20 | 25 |
| <2 | | <5 | <100 | <200 | 151 | <20 | 501 | <20 | 20 |

| Re (ppb) | S (%) | Sb (ppm) | Sc (ppm) | Se (ppm) | Sm (ppb) | Sn (ppb) | Sr (ppm) | Ta (ppb) | Tb (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Aqua Regia | | | | | | | | | |
| | 0.15 | 0.27 | 3.7 | 0.9 | | | 11.8 | | |
| | 0.12 | 0.13 | 2.7 | 0.6 | | | 10.7 | | |
| | 0.22 | 0.13 | 2.8 | 0.7 | | | 10.7 | | |
| | 0.23 | 0.22 | 3.2 | 1.0 | | | 10.2 | | |
| | 0.03 | 0.37 | 2.6 | 1.0 | | | 11.2 | | |
| | 0.15 | 0.12 | 2.3 | 0.4 | | | 9.7 | | |
| | 0.02 | 0.34 | 3.2 | 0.2 | | | 70.3 | | |
| | 0.02 | 0.31 | 3.4 | 0.2 | | | 75.0 | | |
| | 0.02 | 0.29 | 3.6 | 0.4 | | | 73.7 | | |
| | 0.02 | 0.35 | 3.2 | 0.3 | | | 69.8 | | |
| | <0.02 | 0.06 | 1.7 | 0.2 | | | 13.7 | | |
| | 0.03 | 0.09 | 2.5 | 0.3 | | | 14.8 | | |
| | 0.02 | 0.05 | 2.1 | 0.4 | | | 15.0 | | |
| | 0.02 | 0.14 | 1.7 | <0.1 | | | 15.3 | | |
| | 0.03 | 0.08 | 2.4 | 0.1 | | | 15.1 | | |
| | 0.04 | 0.12 | 1.9 | 0.2 | | | 13.8 | | |

| Te (ppb) | Th (ppb) | Ti (ppm) | Tm (ppb) | U (ppb) | V (ppb) | W (ppb) | Y (ppb) | Yb (ppb) | Zn (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl | | | | | | | | | |
| <20 | <20 | 2 | <5 | 20 | 1892 | <10 | 295 | 14 | 10025 |
| <20 | <20 | 1 | <5 | 47 | 3036 | <10 | 352 | 30 | 7439 |
| <20 | <20 | 1 | <5 | 53 | 2608 | <10 | 276 | 18 | 6140 |
| <20 | <20 | 3 | <5 | 22 | 2398 | <10 | 243 | <5 | 10711 |
| <20 | <20 | 2 | <5 | 45 | 2587 | <10 | 258 | 20 | 6024 |
| <20 | <20 | 2 | <5 | 48 | 2613 | <10 | 275 | 13 | 5961 |
| <20 | <20 | <1 | 9 | 63 | 2047 | <10 | 707 | 48 | 3545 |
| <20 | <20 | <1 | 5 | 54 | 1725 | <10 | 609 | 39 | 3009 |
| <20 | <20 | <1 | 7 | 67 | 2278 | <10 | 739 | 54 | 3759 |
| <20 | <20 | <1 | 9 | 73 | 2434 | <10 | 821 | 56 | 3912 |
| <20 | <20 | <1 | 9 | 61 | 2174 | <10 | 708 | 47 | 3615 |
| <20 | <20 | <1 | 9 | 73 | 2346 | <10 | 743 | 49 | 3884 |
| <20 | <20 | <1 | <5 | 33 | 1148 | <10 | 561 | 46 | 1987 |
| <20 | <20 | <1 | 7 | 57 | 1650 | <10 | 745 | 59 | 3159 |
| <20 | <20 | <1 | 8 | 37 | 1123 | <10 | 673 | 57 | 2199 |
| <20 | <20 | <1 | 8 | 31 | 965 | <10 | 626 | 45 | 1957 |

| Te (ppm) | Th (ppm) | Ti (ppm) | Tm (ppb) | U (ppm) | V (ppm) | W (ppm) | Y (ppb) | Yb (ppb) | Zn (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| Aqua Regia | | | | | | | | | |
| 0.03 | 3.8 | 1000 | | 1.5 | 49 | <0.1 | | | 80 |
| 0.05 | 6.2 | 1210 | | 1.4 | 39 | <0.1 | | | 66 |
| 0.10 | 5.9 | 1240 | | 1.3 | 40 | <0.1 | | | 69 |
| 0.06 | 3.1 | 890 | | 1.2 | 44 | <0.1 | | | 72 |
| 0.04 | 6.3 | 1080 | | 2.1 | 56 | <0.1 | | | 88 |
| 0.03 | 5.9 | 1180 | | 1.3 | 35 | <0.1 | | | 61 |
| 0.03 | 5.5 | 690 | | 1.0 | 61 | <0.1 | | | 57 |
| 0.06 | 6.1 | 670 | | 1.0 | 58 | <0.1 | | | 54 |
| 0.02 | 6.0 | 670 | | 1.0 | 58 | <0.1 | | | 57 |
| 0.05 | 5.1 | 620 | | 0.9 | 61 | <0.1 | | | 59 |
| <0.02 | 4.0 | 630 | | 0.3 | 27 | <0.1 | | | 68 |
| <0.02 | 5.6 | 900 | | 0.4 | 40 | <0.1 | | | 94 |
| <0.02 | 4.9 | 730 | | 0.3 | 36 | <0.1 | | | 125 |
| <0.02 | 4.9 | 540 | | 0.3 | 22 | <0.1 | | | 89 |
| 0.02 | 5.1 | 730 | | 0.4 | 32 | <0.1 | | | 153 |
| 0.03 | 3.9 | 620 | | 0.3 | 25 | <0.1 | | | 209 |

| Zr (ppb) | Ca (ppm) | Fe (ppm) | K (ppm) | Mg (ppm) | Mn (ppb) | Na (ppm) | P (ppm) | Tl (ppb) |
|---|---|---|---|---|---|---|---|---|
| 0.25M Hydroxylamine-HCl | | | | | | | | |
| 84 | 34 | 2750 | 80 | 1020 | 23415 | | 209 | 13 |
| 92 | 23 | 2603 | 85 | 802 | 28481 | | 97 | 9 |
| 63 | 24 | 2375 | 84 | 819 | 23645 | | 92 | 11 |
| 137 | 23 | 3424 | 157 | 1530 | 32055 | | 237 | 34 |
| 74 | 24 | 2120 | 79 | 481 | 21566 | | 86 | 9 |
| 75 | 26 | 2313 | 86 | 657 | 22519 | | 89 | 10 |
| 51 | 182 | 737 | 175 | 590 | 31487 | | 33 | 25 |
| 66 | 200 | 653 | 160 | 530 | 26468 | | 26 | 32 |
| 65 | 190 | 793 | 189 | 619 | 31934 | | 35 | 26 |
| 74 | 244 | 817 | 190 | 664 | 38907 | | 34 | 44 |
| 59 | 197 | 752 | 179 | 604 | 30607 | | 34 | 35 |
| 62 | 218 | 859 | 192 | 594 | 31916 | | 39 | 24 |
| <20 | 236 | 386 | 66 | 193 | 15032 | | 31 | 10 |
| <20 | 165 | 562 | 74 | 237 | 70589 | | 36 | 45 |
| <20 | 147 | 415 | 59 | 195 | 18576 | | 33 | 11 |
| <20 | 88 | 376 | 50 | 146 | 16318 | | 26 | 9 |

| Zr (ppb) | Ca (%) | Fe (%) | K (%) | Mg (%) | Mn (ppm) | Na (ppm) | P (ppm) | Tl (ppm) |
|---|---|---|---|---|---|---|---|---|
| Aqua Regia | | | | | | | | |
| | 0.23 | 3.77 | 0.17 | 1.22 | 579 | 110 | 710 | 0.17 |
| | 0.20 | 3.25 | 0.17 | 0.93 | 467 | 50 | 670 | 0.16 |
| | 0.21 | 3.51 | 0.18 | 1.03 | 417 | 50 | 650 | 0.15 |
| | 0.24 | 3.52 | 0.14 | 1.20 | 512 | 90 | 690 | 0.15 |
| | 0.19 | 4.41 | 0.16 | 0.80 | 495 | 50 | 790 | 0.17 |
| | 0.19 | 3.08 | 0.16 | 0.88 | 368 | 40 | 530 | 0.14 |
| | 1.00 | 2.26 | 0.31 | 0.65 | 508 | 600 | 670 | 0.17 |
| | 1.14 | 2.18 | 0.32 | 0.66 | 503 | 590 | 660 | 0.19 |
| | 1.07 | 2.22 | 0.31 | 0.69 | 505 | 600 | 690 | 0.19 |
| | 1.24 | 2.23 | 0.29 | 0.63 | 503 | 570 | 870 | 0.15 |
| | 2.60 | 1.38 | 0.15 | 1.81 | 473 | 90 | 160 | 0.09 |
| | 1.35 | 2.08 | 0.21 | 1.16 | 577 | 120 | 250 | 0.13 |
| | 2.39 | 1.85 | 0.18 | 1.74 | 787 | 100 | 230 | 0.11 |
| | 3.69 | 1.34 | 0.13 | 2.54 | 522 | 80 | 200 | 0.08 |
| | 2.06 | 1.93 | 0.19 | 1.56 | 739 | 100 | 240 | 0.11 |
| | 2.80 | 1.48 | 0.15 | 1.98 | 531 | 90 | 180 | 0.09 |

# APPENDIX G. GAS CHROMATOGRAPHY QUANTIFICATION OF TALBOT GRID PHOSPHOLIPIDS

| Ret Time | Std | Compound | Short nomenclature |
|---|---|---|---|
| 8.49 | BAME 7 | tetradecanoate methyl ester | 14:0 |
| 9.88 | BAME 8 | 13-methyltetradecanoate methyl ester | i15:0/13me14:0 |
| 10.06 | BAME 9 | 12-methyltetradecanoate methyl ester | a15:0/12me14:0 |
| 10.71 | BAME 10 | pentadecanoate methyl ester | 15:0 |
| 10.88 | BAME 11 | 2-hydroxytetradecanoate methyl ester | 14:0-2OH |
| 11.66 | BAME 12 | 3-hydroxytetradecanoate methyl ester | 14:0-3OH |
| 11.70 | | methylpentadecanoate methyl ester | br16:1 |
| 12.01 | | methylpentadecanoate methyl ester | br16:1 |
| 12.14 | BAME 13 | 14-methylpentadecanoate methyl ester | i16:0/14me15:0 |
| 12.38 | 1613.0000 | 13-methylpentadecanoate methyl ester | a16:0/13me15:0 |
| 12.49 | BAME 14 | cis-9-hexadecenoate methyl ester | 16:1w7c |
| 12.60 | P0203 | trans-9-hexadecanoate methyl ester | 16:1w7t |
| 12.71 | | cis-10-hexadecenoate methyl ester | 16:1w6c |
| 12.98 | BAME 15 | hexadecanoate methyl ester | 16:0 |
| 13.09 | | 15-methylhexadec-10-enoic methyl ester | i17:1w7/i17:1 |
| 13.96 | 1792.0000 | 10-methylhexadecanoate methyl ester | 10me16:0/br17:0 |
| 14.13 | | methylhexadecanoate methyl ester | br17:0 |
| 14.40 | BAME 16 | 15-methylhexadecanoate methyl ester | i17:0/15me16:0 |
| 14.59 | | 14-methylhexadecanoate methyl ester | a17:0/14me16:0 |
| 14.68 | H9021 | cis-10-heptadecanoate methyl ester | 17:1w7c |
| 14.89 | BAME 17 | cis-9,10-methylenehexadecanoate methyl ester | cy17:0 |
| 15.23 | BAME 18 | heptadecanoate methyl ester | 17:0 |
| 15.32 | | methylheptadecanoate methyl ester | br18:0 |
| 15.45 | BAME 19 | 2-hydroxyhexadecanoate methyl ester | 17:0-2OH |
| 16.00 | | methylheptadecanoate methyl ester | br18:0 |
| 16.15 | 1796.0000 | 10-methylheptadecanoate methyl ester | 10me17:0 |
| 16.30 | L6503 | cis 6,9,12 octadecatrienoate methyl ester | 18:3w6c |
| 16.42 | | cis 9,12,15 octadecatrienoate methyl ester | 18:3w3c |
| 16.71 | BAME 20 | cis 9,12 octadecatrienoate methyl ester | 18:2w6c |
| 16.86 | BAME 21 | cis-9-octadecenoate methyl ester | 18:1w9c |
| 16.98 | BAME 22 | trans-9-octadecanoate, cis-11-octadecanoate me | 18:1w9t & 18:1w7c |
| 17.11 | V1381 | trans-11-octadecenoic methyl ester | 18:1w7t |
| 17.20 | | cis-12-octadecenoate methyl ester | 18:1w6c |
| 17.44 | BAME 23 | octadecanoate methyl ester | 18:0 |
| 18.29 | | 10-methyloctadecanoate methyl ester | 10me18:0 |
| 18.36 | | methylheptadecanoate methyl ester | br19:0 |
| 18.98 | | 17-methyloctadecanoate methyl ester | i19:0 |
| 19.20 | BAME 24 | cis-9,10-methyleneoctadecanoate methyl ester | cy19:0 |
| 19.58 | AME 25/N537 | nonadecanoate methyl ester | 19:0 |
| 20.68 | | | 20:5w3 |
| 20.89 | | | 20:3w6 |
| 21.22 | | | 20:3w3 |
| 21.65 | BAME 26 | eicosanoate methyl ester | 20:0 |

| MW (ug/umol) | Signature lipid biomarker (SLB) | L0-100 Top | L0-100 Mid | L0-100 Bot |
|---|---|---|---|---|
| 242.40 | | 0.0030 | 0.0026 | 0.0011 |
| 256.42 | SRB, Gram + | 0.0165 | 0.0145 | 0.0089 |
| 256.42 | SRB, Gram + | 0.0187 | 0.0139 | 0.0081 |
| 256.42 | | 0.0023 | 0.0025 | 0.0015 |
| 258.40 | Gram + | 0.0000 | 0.0000 | 0.0000 |
| 258.40 | Gram + | 0.0051 | 0.0044 | 0.0029 |
| 270.45 | | 0.0000 | 0.0000 | 0.0004 |
| 270.45 | | 0.0000 | 0.0000 | 0.0000 |
| 270.45 | Gram + | 0.0161 | 0.0129 | 0.0086 |
| 270.45 | Gram + | 0.0044 | 0.0037 | 0.0022 |
| 268.46 | Thioploca/Beggiatoa, SRB, Fe-reducers, Gram - | 0.0208 | 0.0203 | 0.0150 |
| 268.46 | Thioploca/Beggiatoa, SRB, Gram - | 0.0032 | 0.0021 | 0.0004 |
| 268.46 | Type I Methanotrophs, Gram - | 0.0066 | 0.0064 | 0.0042 |
| 270.45 | | 0.0342 | 0.0322 | 0.0233 |
| 282.47 | Anaerobes, SRB and DIRB (Desulfovibrio) | 0.0086 | 0.0071 | 0.0062 |
| 284.46 | Desulfobacter, Desulfobacula, Geobacter | 0.0188 | 0.0209 | 0.0195 |
| 284.46 | | 0.0039 | 0.0041 | 0.0031 |
| 284.46 | Gram + | 0.0048 | 0.0045 | 0.0038 |
| 284.46 | | 0.0074 | 0.0071 | 0.0059 |
| 282.47 | Gram - | 0.0025 | 0.0027 | 0.0022 |
| 282.46 | Gram - | 0.0148 | 0.0151 | 0.0131 |
| 284.46 | | 0.0011 | 0.0010 | 0.0006 |
| 298.50 | | 0.0014 | 0.0051 | 0.0080 |
| 286.45 | Gram + | 0.0030 | 0.0012 | 0.0014 |
| 298.50 | | 0.0010 | 0.0000 | 0.0000 |
| 298.50 | Desulfovibrio, Actinomycetes, Gram + | 0.0041 | 0.0036 | 0.0021 |
| 292.53 | Fungi | 0.0047 | 0.0000 | 0.0011 |
| 292.53 | Fungi, green algae, higher plants | 0.0000 | 0.0013 | 0.0004 |
| 294.52 | Fungi, Cyanophytes | 0.0102 | 0.0155 | 0.0127 |
| 296.51 | Thioploca/Beggiatoa, SRB, Gram - | 0.0326 | 0.0261 | 0.0198 |
| 296.51 | Thioploca/Beggiatoa, SRB, Gram - | 0.0525 | 0.0443 | 0.0276 |
| 296.51 | Thioploca/Beggiatoa, Gram - | 0.0017 | 0.0020 | 0.0023 |
| 296.51 | Type II Methanotrophs, Gram - | 0.0019 | 0.0028 | 0.0007 |
| 298.50 | | 0.0062 | 0.0073 | 0.0049 |
| 312.53 | Actinomycetes | 0.0046 | 0.0087 | 0.0033 |
| 312.53 | | 0.0003 | 0.0016 | 0.0006 |
| 312.53 | | 0.0065 | 0.0005 | 0.0003 |
| 310.51 | Gram - | 0.0188 | 0.0031 | 0.0077 |
| 312.53 | | 0.0000 | 0.0000 | 0.0000 |
| 316.61 | Diatoms/higher plants | 0.0000 | 0.0000 | 0.0000 |
| 320.59 | Protozoa | 0.0000 | 0.0000 | 0.0000 |
| 320.59 | | 0.0000 | 0.0000 | 0.0004 |
| 326.56 | | 0.0062 | 0.0058 | 0.0047 |

| L0-300 Top | L0-300 Mid | L0-300 Bot | L0-500 Top | L0-500 Mid | L0-500 Bot | L0-600 Top |
|---|---|---|---|---|---|---|
| 0.0010 | 0.0006 | 0.0002 | 0.0070 | 0.0194 | 0.0012 | 0.0035 |
| 0.0077 | 0.0053 | 0.0029 | 0.0381 | 0.0337 | 0.0129 | 0.0263 |
| 0.0054 | 0.0040 | 0.0026 | 0.0406 | 0.0285 | 0.0097 | 0.0123 |
| 0.0017 | 0.0008 | 0.0006 | 0.0057 | 0.0056 | 0.0026 | 0.0035 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0002 | 0.0009 | 0.0000 | 0.0100 | 0.0094 | 0.0034 | 0.0030 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0026 | 0.0028 | 0.0016 | 0.0312 | 0.0282 | 0.0118 | 0.0146 |
| 0.0010 | 0.0013 | 0.0006 | 0.0101 | 0.0082 | 0.0036 | 0.0036 |
| 0.0101 | 0.0086 | 0.0043 | 0.0435 | 0.0394 | 0.0202 | 0.0191 |
| 0.0016 | 0.0003 | 0.0000 | 0.0066 | 0.0059 | 0.0012 | 0.0017 |
| 0.0037 | 0.0027 | 0.0015 | 0.0143 | 0.0119 | 0.0058 | 0.0112 |
| 0.0220 | 0.0202 | 0.0111 | 0.0710 | 0.0641 | 0.0333 | 0.0451 |
| 0.0000 | 0.0009 | 0.0003 | 0.0165 | 0.0139 | 0.0080 | 0.0013 |
| 0.0059 | 0.0059 | 0.0043 | 0.0300 | 0.0288 | 0.0229 | 0.0192 |
| 0.0004 | 0.0014 | 0.0006 | 0.0057 | 0.0074 | 0.0044 | 0.0043 |
| 0.0012 | 0.0016 | 0.0011 | 0.0079 | 0.0069 | 0.0047 | 0.0087 |
| 0.0020 | 0.0026 | 0.0020 | 0.0158 | 0.0154 | 0.0092 | 0.0090 |
| 0.0003 | 0.0000 | 0.0003 | 0.0044 | 0.0069 | 0.0023 | 0.0007 |
| 0.0096 | 0.0086 | 0.0043 | 0.0350 | 0.0225 | 0.0133 | 0.0206 |
| 0.0003 | 0.0008 | 0.0002 | 0.0044 | 0.0028 | 0.0013 | 0.0033 |
| 0.0002 | 0.0010 | 0.0002 | 0.0041 | 0.0038 | 0.0084 | 0.0115 |
| 0.0009 | 0.0000 | 0.0004 | 0.0033 | 0.0013 | 0.0018 | 0.0016 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0007 |
| 0.0003 | 0.0004 | 0.0000 | 0.0054 | 0.0043 | 0.0024 | 0.0046 |
| 0.0050 | 0.0004 | 0.0000 | 0.0059 | 0.0000 | 0.0015 | 0.0043 |
| 0.0005 | 0.0030 | 0.0000 | 0.0000 | 0.0063 | 0.0006 | 0.0008 |
| 0.0086 | 0.0107 | 0.0047 | 0.0213 | 0.0244 | 0.0170 | 0.0048 |
| 0.0191 | 0.0131 | 0.0089 | 0.0642 | 0.0481 | 0.0317 | 0.0417 |
| 0.0180 | 0.0175 | 0.0136 | 0.1098 | 0.0689 | 0.0436 | 0.0465 |
| 0.0000 | 0.0000 | 0.0000 | 0.0031 | 0.0009 | 0.0006 | 0.0015 |
| 0.0003 | 0.0011 | 0.0008 | 0.0050 | 0.0051 | 0.0026 | 0.0022 |
| 0.0047 | 0.0045 | 0.0036 | 0.0165 | 0.0116 | 0.0110 | 0.0111 |
| 0.0006 | 0.0022 | 0.0011 | 0.0081 | 0.0146 | 0.0050 | 0.0051 |
| 0.0010 | 0.0007 | 0.0006 | 0.0005 | 0.0008 | 0.0000 | 0.0000 |
| 0.0073 | 0.0007 | 0.0010 | 0.0097 | 0.0006 | 0.0021 | 0.0052 |
| 0.0078 | 0.0009 | 0.0030 | 0.0465 | 0.0133 | 0.0151 | 0.0208 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0015 | 0.0000 | 0.0000 |
| 0.0003 | 0.0004 | 0.0002 | 0.0028 | 0.0027 | 0.0013 | 0.0006 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0008 | 0.0000 |
| 0.0083 | 0.0066 | 0.0061 | 0.0286 | 0.0292 | 0.0152 | 0.0102 |

| L0-600 Mid | L0-600 Bot | L0-700 Top | L0-700 Mid | L0-700 Bot | L1-500 Top | L1-500 Mid |
|---|---|---|---|---|---|---|
| 0.0037 | 0.0009 | 0.0023 | 0.0149 | 0.0026 | 0.0022 | 0.0033 |
| 0.0195 | 0.0086 | 0.0116 | 0.0184 | 0.0166 | 0.0175 | 0.0178 |
| 0.0106 | 0.0048 | 0.0108 | 0.0139 | 0.0114 | 0.0141 | 0.0144 |
| 0.0026 | 0.0016 | 0.0016 | 0.0029 | 0.0025 | 0.0025 | 0.0019 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0025 | 0.0024 | 0.0012 | 0.0033 | 0.0025 | 0.0016 | 0.0029 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0133 | 0.0088 | 0.0056 | 0.0117 | 0.0104 | 0.0085 | 0.0115 |
| 0.0022 | 0.0013 | 0.0020 | 0.0032 | 0.0028 | 0.0027 | 0.0022 |
| 0.0086 | 0.0085 | 0.0114 | 0.0194 | 0.0186 | 0.0184 | 0.0180 |
| 0.0012 | 0.0002 | 0.0005 | 0.0000 | 0.0013 | 0.0005 | 0.0000 |
| 0.0033 | 0.0027 | 0.0050 | 0.0065 | 0.0073 | 0.0087 | 0.0096 |
| 0.0314 | 0.0243 | 0.0255 | 0.0393 | 0.0441 | 0.0374 | 0.0387 |
| 0.0019 | 0.0019 | 0.0018 | 0.0029 | 0.0029 | 0.0023 | 0.0034 |
| 0.0159 | 0.0116 | 0.0085 | 0.0186 | 0.0183 | 0.0144 | 0.0159 |
| 0.0031 | 0.0026 | 0.0019 | 0.0038 | 0.0045 | 0.0042 | 0.0043 |
| 0.0055 | 0.0034 | 0.0032 | 0.0049 | 0.0042 | 0.0052 | 0.0069 |
| 0.0047 | 0.0040 | 0.0036 | 0.0064 | 0.0070 | 0.0060 | 0.0067 |
| 0.0006 | 0.0011 | 0.0003 | 0.0027 | 0.0015 | 0.0009 | 0.0007 |
| 0.0114 | 0.0104 | 0.0105 | 0.0158 | 0.0151 | 0.0161 | 0.0159 |
| 0.0017 | 0.0015 | 0.0012 | 0.0026 | 0.0017 | 0.0020 | 0.0024 |
| 0.0082 | 0.0062 | 0.0027 | 0.0061 | 0.0038 | 0.0049 | 0.0073 |
| 0.0008 | 0.0002 | 0.0006 | 0.0000 | 0.0000 | 0.0005 | 0.0000 |
| 0.0017 | 0.0000 | 0.0008 | 0.0000 | 0.0000 | 0.0006 | 0.0000 |
| 0.0059 | 0.0058 | 0.0019 | 0.0032 | 0.0031 | 0.0030 | 0.0046 |
| 0.0000 | 0.0013 | 0.0028 | 0.0000 | 0.0012 | 0.0025 | 0.0008 |
| 0.0040 | 0.0005 | 0.0000 | 0.0087 | 0.0009 | 0.0003 | 0.0040 |
| 0.0014 | 0.0074 | 0.0047 | 0.0079 | 0.0154 | 0.0064 | 0.0112 |
| 0.0187 | 0.0207 | 0.0211 | 0.0249 | 0.0395 | 0.0309 | 0.0305 |
| 0.0229 | 0.0255 | 0.0338 | 0.0325 | 0.0465 | 0.0392 | 0.0544 |
| 0.0027 | 0.0015 | 0.0018 | 0.0000 | 0.0017 | 0.0037 | 0.0021 |
| 0.0008 | 0.0017 | 0.0009 | 0.0028 | 0.0031 | 0.0016 | 0.0050 |
| 0.0073 | 0.0063 | 0.0054 | 0.0089 | 0.0122 | 0.0081 | 0.0084 |
| 0.0034 | 0.0031 | 0.0007 | 0.0039 | 0.0024 | 0.0027 | 0.0024 |
| 0.0026 | 0.0011 | 0.0014 | 0.0017 | 0.0005 | 0.0009 | 0.0024 |
| 0.0000 | 0.0003 | 0.0010 | 0.0000 | 0.0021 | 0.0009 | 0.0000 |
| 0.0006 | 0.0063 | 0.0098 | 0.0072 | 0.0181 | 0.0132 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0016 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0016 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0002 | 0.0003 | 0.0012 | 0.0014 | 0.0005 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0078 | 0.0058 | 0.0069 | 0.0113 | 0.0226 | 0.0078 | 0.0085 |

| L1-500 Bot | L1-600 Top | L1-600 Mid | L1-600 Bot | L1-700 Top | L1-700 Mid | L1-700 Bot |
|---|---|---|---|---|---|---|
| 0.0041 | 0.0026 | 0.0009 | 0.0009 | 0.0040 | 0.0000 | 0.0013 |
| 0.0226 | 0.0063 | 0.0048 | 0.0063 | 0.0107 | 0.0029 | 0.0080 |
| 0.0148 | 0.0042 | 0.0042 | 0.0050 | 0.0071 | 0.0029 | 0.0050 |
| 0.0030 | 0.0012 | 0.0007 | 0.0010 | 0.0025 | 0.0008 | 0.0012 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0033 | 0.0002 | 0.0005 | 0.0008 | 0.0008 | 0.0004 | 0.0005 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0127 | 0.0024 | 0.0019 | 0.0032 | 0.0057 | 0.0041 | 0.0033 |
| 0.0038 | 0.0016 | 0.0010 | 0.0014 | 0.0030 | 0.0014 | 0.0014 |
| 0.0223 | 0.0072 | 0.0079 | 0.0103 | 0.0185 | 0.0140 | 0.0116 |
| 0.0016 | 0.0007 | 0.0000 | 0.0006 | 0.0019 | 0.0000 | 0.0013 |
| 0.0092 | 0.0028 | 0.0022 | 0.0029 | 0.0051 | 0.0013 | 0.0027 |
| 0.0454 | 0.0182 | 0.0137 | 0.0164 | 0.0344 | 0.0222 | 0.0248 |
| 0.0032 | 0.0003 | 0.0013 | 0.0014 | 0.0018 | 0.0026 | 0.0008 |
| 0.0183 | 0.0065 | 0.0076 | 0.0087 | 0.0105 | 0.0116 | 0.0062 |
| 0.0041 | 0.0018 | 0.0007 | 0.0010 | 0.0020 | 0.0015 | 0.0008 |
| 0.0055 | 0.0039 | 0.0012 | 0.0016 | 0.0023 | 0.0025 | 0.0015 |
| 0.0073 | 0.0016 | 0.0013 | 0.0019 | 0.0040 | 0.0052 | 0.0039 |
| 0.0012 | 0.0013 | 0.0005 | 0.0008 | 0.0000 | 0.0015 | 0.0010 |
| 0.0175 | 0.0083 | 0.0056 | 0.0046 | 0.0124 | 0.0067 | 0.0074 |
| 0.0022 | 0.0018 | 0.0003 | 0.0007 | 0.0019 | 0.0015 | 0.0006 |
| 0.0063 | 0.0011 | 0.0008 | 0.0013 | 0.0009 | 0.0048 | 0.0009 |
| 0.0000 | 0.0007 | 0.0000 | 0.0000 | 0.0008 | 0.0009 | 0.0000 |
| 0.0004 | 0.0011 | 0.0000 | 0.0000 | 0.0018 | 0.0000 | 0.0000 |
| 0.0052 | 0.0012 | 0.0000 | 0.0008 | 0.0018 | 0.0000 | 0.0000 |
| 0.0025 | 0.0030 | 0.0000 | 0.0000 | 0.0058 | 0.0000 | 0.0000 |
| 0.0020 | 0.0014 | 0.0019 | 0.0009 | 0.0007 | 0.0021 | 0.0008 |
| 0.0155 | 0.0030 | 0.0044 | 0.0045 | 0.0103 | 0.0087 | 0.0105 |
| 0.0395 | 0.0241 | 0.0127 | 0.0183 | 0.0246 | 0.0170 | 0.0195 |
| 0.0507 | 0.0481 | 0.0220 | 0.0182 | 0.0313 | 0.0265 | 0.0190 |
| 0.0021 | 0.0016 | 0.0000 | 0.0000 | 0.0003 | 0.0000 | 0.0000 |
| 0.0041 | 0.0005 | 0.0006 | 0.0010 | 0.0029 | 0.0015 | 0.0009 |
| 0.0113 | 0.0036 | 0.0031 | 0.0040 | 0.0092 | 0.0091 | 0.0084 |
| 0.0025 | 0.0009 | 0.0016 | 0.0016 | 0.0027 | 0.0039 | 0.0034 |
| 0.0018 | 0.0018 | 0.0013 | 0.0009 | 0.0014 | 0.0011 | 0.0000 |
| 0.0024 | 0.0005 | 0.0000 | 0.0000 | 0.0035 | 0.0015 | 0.0022 |
| 0.0080 | 0.0055 | 0.0000 | 0.0000 | 0.0101 | 0.0006 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0016 | 0.0000 | 0.0000 | 0.0000 | 0.0018 | 0.0026 | 0.0019 |
| 0.0000 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0192 | 0.0032 | 0.0029 | 0.0045 | 0.0173 | 0.0192 | 0.0191 |

| L2-50 Mid | L2-250 Top | L2-250 Mid | L2-400 Top | L2-400 Mid | L2-400 Bot | L2-500 Top |
|---|---|---|---|---|---|---|
| 0.0042 | 0.0078 | 0.0028 | 0.0019 | 0.0011 | 0.0025 | 0.0042 |
| 0.0209 | 0.0290 | 0.0142 | 0.0150 | 0.0098 | 0.0162 | 0.0238 |
| 0.0219 | 0.0242 | 0.0122 | 0.0124 | 0.0083 | 0.0142 | 0.0216 |
| 0.0037 | 0.0050 | 0.0017 | 0.0013 | 0.0014 | 0.0038 | 0.0036 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0053 | 0.0082 | 0.0038 | 0.0026 | 0.0018 | 0.0023 | 0.0032 |
| 0.0000 | 0.0000 | 0.0011 | 0.0000 | 0.0000 | 0.0005 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0168 | 0.0240 | 0.0101 | 0.0111 | 0.0071 | 0.0067 | 0.0128 |
| 0.0070 | 0.0097 | 0.0036 | 0.0032 | 0.0028 | 0.0037 | 0.0043 |
| 0.0751 | 0.0899 | 0.0284 | 0.0155 | 0.0158 | 0.0238 | 0.0244 |
| 0.0031 | 0.0079 | 0.0018 | 0.0012 | 0.0009 | 0.0007 | 0.0012 |
| 0.0128 | 0.0187 | 0.0092 | 0.0055 | 0.0051 | 0.0069 | 0.0112 |
| 0.0709 | 0.0926 | 0.0388 | 0.0303 | 0.0253 | 0.0334 | 0.0516 |
| 0.0116 | 0.0178 | 0.0074 | 0.0047 | 0.0037 | 0.0032 | 0.0052 |
| 0.0341 | 0.0542 | 0.0271 | 0.0132 | 0.0153 | 0.0175 | 0.0175 |
| 0.0045 | 0.0058 | 0.0027 | 0.0028 | 0.0020 | 0.0018 | 0.0055 |
| 0.0038 | 0.0095 | 0.0056 | 0.0041 | 0.0035 | 0.0041 | 0.0058 |
| 0.0109 | 0.0122 | 0.0061 | 0.0048 | 0.0038 | 0.0039 | 0.0079 |
| 0.0034 | 0.0043 | 0.0021 | 0.0012 | 0.0014 | 0.0010 | 0.0000 |
| 0.0264 | 0.0277 | 0.0122 | 0.0169 | 0.0127 | 0.0178 | 0.0239 |
| 0.0030 | 0.0020 | 0.0009 | 0.0000 | 0.0011 | 0.0010 | 0.0023 |
| 0.0097 | 0.0131 | 0.0122 | 0.0036 | 0.0035 | 0.0043 | 0.0051 |
| 0.0031 | 0.0031 | 0.0021 | 0.0000 | 0.0007 | 0.0000 | 0.0005 |
| 0.0000 | 0.0000 | 0.0004 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0021 | 0.0030 | 0.0016 | 0.0031 | 0.0025 | 0.0015 | 0.0026 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0044 | 0.0027 | 0.0030 | 0.0012 | 0.0022 | 0.0015 | 0.0018 |
| 0.0250 | 0.0313 | 0.0142 | 0.0063 | 0.0054 | 0.0074 | 0.0152 |
| 0.0497 | 0.0593 | 0.0256 | 0.0216 | 0.0153 | 0.0165 | 0.0437 |
| 0.0813 | 0.1076 | 0.0452 | 0.0521 | 0.0358 | 0.0302 | 0.0749 |
| 0.0000 | 0.0000 | 0.0000 | 0.0012 | 0.0000 | 0.0009 | 0.0027 |
| 0.0056 | 0.0080 | 0.0030 | 0.0028 | 0.0016 | 0.0018 | 0.0053 |
| 0.0133 | 0.0142 | 0.0085 | 0.0051 | 0.0054 | 0.0065 | 0.0118 |
| 0.0162 | 0.0269 | 0.0093 | 0.0068 | 0.0055 | 0.0044 | 0.0046 |
| 0.0009 | 0.0000 | 0.0010 | 0.0005 | 0.0012 | 0.0017 | 0.0007 |
| 0.0011 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0004 | 0.0004 |
| 0.0050 | 0.0021 | 0.0018 | 0.0022 | 0.0018 | 0.0017 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0010 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0004 | 0.0000 | 0.0000 | 0.0002 | 0.0000 |
| 0.0137 | 0.0090 | 0.0058 | 0.0021 | 0.0031 | 0.0027 | 0.0137 |

| L2-500 Mid | L2-500 Bot | L2-550 Top | L2-550 Mid | L2-550 Bot | L2-600 Top | L2-600 Mid |
|---|---|---|---|---|---|---|
| 0.0021 | 0.0042 | 0.0036 | 0.0022 | 0.0034 | 0.0024 | 0.0023 |
| 0.0146 | 0.0215 | 0.0251 | 0.0176 | 0.0187 | 0.0153 | 0.0173 |
| 0.0123 | 0.0145 | 0.0180 | 0.0122 | 0.0123 | 0.0108 | 0.0119 |
| 0.0022 | 0.0044 | 0.0023 | 0.0025 | 0.0024 | 0.0022 | 0.0038 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0030 | 0.0036 | 0.0030 | 0.0025 | 0.0023 | 0.0015 | 0.0026 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0119 | 0.0129 | 0.0139 | 0.0124 | 0.0101 | 0.0092 | 0.0127 |
| 0.0030 | 0.0041 | 0.0031 | 0.0024 | 0.0031 | 0.0026 | 0.0031 |
| 0.0161 | 0.0236 | 0.0203 | 0.0182 | 0.0169 | 0.0161 | 0.0204 |
| 0.0003 | 0.0012 | 0.0000 | 0.0005 | 0.0015 | 0.0006 | 0.0014 |
| 0.0062 | 0.0087 | 0.0119 | 0.0092 | 0.0072 | 0.0072 | 0.0073 |
| 0.0381 | 0.0491 | 0.0431 | 0.0450 | 0.0365 | 0.0352 | 0.0485 |
| 0.0053 | 0.0059 | 0.0042 | 0.0033 | 0.0032 | 0.0037 | 0.0035 |
| 0.0200 | 0.0218 | 0.0182 | 0.0186 | 0.0146 | 0.0101 | 0.0168 |
| 0.0037 | 0.0046 | 0.0054 | 0.0050 | 0.0038 | 0.0038 | 0.0048 |
| 0.0047 | 0.0047 | 0.0059 | 0.0055 | 0.0041 | 0.0036 | 0.0044 |
| 0.0071 | 0.0088 | 0.0071 | 0.0087 | 0.0063 | 0.0044 | 0.0074 |
| 0.0015 | 0.0022 | 0.0007 | 0.0019 | 0.0014 | 0.0000 | 0.0012 |
| 0.0143 | 0.0160 | 0.0194 | 0.0175 | 0.0137 | 0.0174 | 0.0192 |
| 0.0012 | 0.0022 | 0.0020 | 0.0020 | 0.0016 | 0.0012 | 0.0019 |
| 0.0049 | 0.0062 | 0.0092 | 0.0068 | 0.0049 | 0.0032 | 0.0044 |
| 0.0005 | 0.0011 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0003 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0030 | 0.0028 | 0.0033 | 0.0035 | 0.0026 | 0.0021 | 0.0040 |
| 0.0000 | 0.0013 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0007 |
| 0.0023 | 0.0023 | 0.0008 | 0.0033 | 0.0018 | 0.0000 | 0.0023 |
| 0.0140 | 0.0253 | 0.0076 | 0.0133 | 0.0130 | 0.0095 | 0.0222 |
| 0.0273 | 0.0398 | 0.0375 | 0.0400 | 0.0293 | 0.0342 | 0.0420 |
| 0.0440 | 0.0503 | 0.0693 | 0.0513 | 0.0406 | 0.0531 | 0.0544 |
| 0.0014 | 0.0015 | 0.0033 | 0.0009 | 0.0017 | 0.0021 | 0.0008 |
| 0.0032 | 0.0041 | 0.0060 | 0.0044 | 0.0031 | 0.0040 | 0.0045 |
| 0.0067 | 0.0114 | 0.0090 | 0.0134 | 0.0088 | 0.0054 | 0.0147 |
| 0.0045 | 0.0048 | 0.0029 | 0.0041 | 0.0033 | 0.0040 | 0.0052 |
| 0.0015 | 0.0012 | 0.0010 | 0.0022 | 0.0012 | 0.0005 | 0.0004 |
| 0.0000 | 0.0026 | 0.0000 | 0.0000 | 0.0015 | 0.0000 | 0.0009 |
| 0.0014 | 0.0029 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0017 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0016 | 0.0016 | 0.0004 | 0.0015 | 0.0008 | 0.0000 | 0.0023 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0203 | 0.0181 | 0.0076 | 0.0249 | 0.0158 | 0.0059 | 0.0329 |

| L2-600 Bot | L2-650 Top | L2-650 Mid | L2-650 Bot | L2-675 Top | L2-675 Mid | L2-675 Bot |
|---|---|---|---|---|---|---|
| 0.0035 | 0.0025 | 0.0015 | 0.0034 | 0.0017 | 0.0023 | 0.0022 |
| 0.0244 | 0.0184 | 0.0098 | 0.0246 | 0.0070 | 0.0121 | 0.0123 |
| 0.0156 | 0.0151 | 0.0065 | 0.0107 | 0.0041 | 0.0057 | 0.0082 |
| 0.0042 | 0.0022 | 0.0016 | 0.0037 | 0.0008 | 0.0016 | 0.0019 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0039 | 0.0029 | 0.0018 | 0.0033 | 0.0006 | 0.0010 | 0.0019 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0007 | 0.0000 | 0.0003 | 0.0000 |
| 0.0137 | 0.0129 | 0.0073 | 0.0114 | 0.0028 | 0.0069 | 0.0054 |
| 0.0042 | 0.0031 | 0.0016 | 0.0035 | 0.0010 | 0.0024 | 0.0029 |
| 0.0237 | 0.0160 | 0.0089 | 0.0218 | 0.0078 | 0.0140 | 0.0146 |
| 0.0018 | 0.0000 | 0.0005 | 0.0026 | 0.0006 | 0.0017 | 0.0017 |
| 0.0077 | 0.0101 | 0.0040 | 0.0081 | 0.0037 | 0.0049 | 0.0055 |
| 0.0499 | 0.0390 | 0.0240 | 0.0492 | 0.0169 | 0.0296 | 0.0265 |
| 0.0040 | 0.0032 | 0.0016 | 0.0028 | 0.0000 | 0.0000 | 0.0015 |
| 0.0173 | 0.0148 | 0.0093 | 0.0177 | 0.0039 | 0.0125 | 0.0120 |
| 0.0050 | 0.0053 | 0.0027 | 0.0041 | 0.0014 | 0.0024 | 0.0022 |
| 0.0044 | 0.0050 | 0.0028 | 0.0034 | 0.0015 | 0.0023 | 0.0022 |
| 0.0077 | 0.0067 | 0.0039 | 0.0086 | 0.0023 | 0.0048 | 0.0040 |
| 0.0006 | 0.0004 | 0.0005 | 0.0015 | 0.0004 | 0.0011 | 0.0008 |
| 0.0209 | 0.0153 | 0.0083 | 0.0125 | 0.0061 | 0.0107 | 0.0097 |
| 0.0021 | 0.0013 | 0.0008 | 0.0015 | 0.0005 | 0.0013 | 0.0009 |
| 0.0046 | 0.0062 | 0.0034 | 0.0030 | 0.0004 | 0.0009 | 0.0013 |
| 0.0000 | 0.0000 | 0.0002 | 0.0003 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0039 | 0.0034 | 0.0028 | 0.0029 | 0.0004 | 0.0013 | 0.0006 |
| 0.0000 | 0.0000 | 0.0000 | 0.0025 | 0.0000 | 0.0000 | 0.0006 |
| 0.0019 | 0.0004 | 0.0017 | 0.0030 | 0.0007 | 0.0025 | 0.0019 |
| 0.0207 | 0.0100 | 0.0114 | 0.0254 | 0.0038 | 0.0101 | 0.0072 |
| 0.0394 | 0.0335 | 0.0185 | 0.0366 | 0.0105 | 0.0218 | 0.0177 |
| 0.0570 | 0.0546 | 0.0256 | 0.0317 | 0.0159 | 0.0230 | 0.0243 |
| 0.0012 | 0.0024 | 0.0013 | 0.0005 | 0.0000 | 0.0000 | 0.0000 |
| 0.0044 | 0.0050 | 0.0022 | 0.0033 | 0.0020 | 0.0019 | 0.0020 |
| 0.0136 | 0.0074 | 0.0059 | 0.0132 | 0.0050 | 0.0088 | 0.0070 |
| 0.0049 | 0.0042 | 0.0022 | 0.0041 | 0.0006 | 0.0025 | 0.0026 |
| 0.0008 | 0.0006 | 0.0010 | 0.0003 | 0.0005 | 0.0010 | 0.0011 |
| 0.0016 | 0.0000 | 0.0009 | 0.0031 | 0.0004 | 0.0009 | 0.0011 |
| 0.0000 | 0.0000 | 0.0000 | 0.0003 | 0.0010 | 0.0000 | 0.0006 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0008 | 0.0000 | 0.0004 | 0.0020 | 0.0000 | 0.0014 | 0.0008 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0203 | 0.0090 | 0.0083 | 0.0355 | 0.0059 | 0.0210 | 0.0138 |

| L2-700 Top | L2-700 Mid | L2-700 Bot | L2-800 Top | L2-800 Mid | L2-800 Bot | L2.5-450 Top |
|---|---|---|---|---|---|---|
| 0.0025 | 0.0011 | 0.0021 | 0.0039 | 0.0043 | 0.0022 | 0.0025 |
| 0.0124 | 0.0113 | 0.0138 | 0.0257 | 0.0254 | 0.0162 | 0.0123 |
| 0.0081 | 0.0072 | 0.0095 | 0.0160 | 0.0143 | 0.0098 | 0.0143 |
| 0.0020 | 0.0022 | 0.0035 | 0.0036 | 0.0045 | 0.0023 | 0.0012 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0016 | 0.0024 | 0.0027 | 0.0024 | 0.0038 | 0.0040 | 0.0013 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0078 | 0.0095 | 0.0089 | 0.0133 | 0.0172 | 0.0128 | 0.0058 |
| 0.0020 | 0.0021 | 0.0027 | 0.0038 | 0.0046 | 0.0024 | 0.0026 |
| 0.0123 | 0.0122 | 0.0143 | 0.0217 | 0.0267 | 0.0135 | 0.0151 |
| 0.0006 | 0.0007 | 0.0010 | 0.0009 | 0.0038 | 0.0008 | 0.0005 |
| 0.0068 | 0.0050 | 0.0048 | 0.0138 | 0.0122 | 0.0044 | 0.0063 |
| 0.0260 | 0.0307 | 0.0283 | 0.0477 | 0.0678 | 0.0288 | 0.0240 |
| 0.0020 | 0.0033 | 0.0042 | 0.0033 | 0.0046 | 0.0037 | 0.0035 |
| 0.0090 | 0.0143 | 0.0168 | 0.0181 | 0.0278 | 0.0125 | 0.0115 |
| 0.0035 | 0.0030 | 0.0030 | 0.0068 | 0.0070 | 0.0034 | 0.0034 |
| 0.0030 | 0.0039 | 0.0037 | 0.0061 | 0.0071 | 0.0037 | 0.0034 |
| 0.0044 | 0.0057 | 0.0051 | 0.0082 | 0.0113 | 0.0051 | 0.0042 |
| 0.0005 | 0.0010 | 0.0009 | 0.0015 | 0.0028 | 0.0016 | 0.0000 |
| 0.0111 | 0.0133 | 0.0110 | 0.0230 | 0.0211 | 0.0147 | 0.0109 |
| 0.0013 | 0.0012 | 0.0009 | 0.0018 | 0.0031 | 0.0007 | 0.0008 |
| 0.0032 | 0.0055 | 0.0058 | 0.0069 | 0.0071 | 0.0066 | 0.0011 |
| 0.0000 | 0.0003 | 0.0009 | 0.0000 | 0.0000 | 0.0007 | 0.0006 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0006 |
| 0.0021 | 0.0042 | 0.0032 | 0.0029 | 0.0050 | 0.0042 | 0.0010 |
| 0.0000 | 0.0000 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0028 |
| 0.0015 | 0.0024 | 0.0013 | 0.0009 | 0.0046 | 0.0007 | 0.0005 |
| 0.0051 | 0.0089 | 0.0108 | 0.0073 | 0.0299 | 0.0087 | 0.0052 |
| 0.0239 | 0.0264 | 0.0203 | 0.0461 | 0.0639 | 0.0230 | 0.0176 |
| 0.0334 | 0.0366 | 0.0263 | 0.0651 | 0.0557 | 0.0401 | 0.0331 |
| 0.0014 | 0.0009 | 0.0014 | 0.0045 | 0.0000 | 0.0018 | 0.0003 |
| 0.0034 | 0.0027 | 0.0019 | 0.0057 | 0.0039 | 0.0025 | 0.0039 |
| 0.0060 | 0.0085 | 0.0074 | 0.0084 | 0.0181 | 0.0065 | 0.0050 |
| 0.0025 | 0.0035 | 0.0045 | 0.0034 | 0.0048 | 0.0035 | 0.0016 |
| 0.0012 | 0.0014 | 0.0012 | 0.0007 | 0.0019 | 0.0009 | 0.0006 |
| 0.0009 | 0.0006 | 0.0014 | 0.0000 | 0.0000 | 0.0010 | 0.0007 |
| 0.0147 | 0.0000 | 0.0019 | 0.0190 | 0.0000 | 0.0016 | 0.0085 |
| 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0010 | 0.0011 | 0.0002 | 0.0000 | 0.0023 | 0.0009 | 0.0003 |
| 0.0000 | 0.0000 | 0.0002 | 0.0000 | 0.0000 | 0.0000 | 0.0003 |
| 0.0100 | 0.0159 | 0.0101 | 0.0061 | 0.0270 | 0.0069 | 0.0048 |

| L2.5-450 Mid | L2.5-450 Bot | L2.5-500 Top | L2.5-500 Mid | L2.5-500 Bot | L2.5-600 Top | L2.5-600 Mid |
|---|---|---|---|---|---|---|
| 0.0007 | 0.0003 | 0.0035 | 0.0010 | 0.0034 | 0.0037 | 0.0051 |
| 0.0069 | 0.0047 | 0.0160 | 0.0099 | 0.0178 | 0.0217 | 0.0308 |
| 0.0058 | 0.0047 | 0.0112 | 0.0068 | 0.0124 | 0.0155 | 0.0213 |
| 0.0012 | 0.0005 | 0.0024 | 0.0016 | 0.0034 | 0.0028 | 0.0049 |
| 0.0000 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0014 | 0.0004 | 0.0015 | 0.0009 | 0.0027 | 0.0036 | 0.0059 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0052 | 0.0023 | 0.0074 | 0.0055 | 0.0092 | 0.0172 | 0.0224 |
| 0.0017 | 0.0011 | 0.0028 | 0.0022 | 0.0036 | 0.0041 | 0.0065 |
| 0.0084 | 0.0077 | 0.0169 | 0.0127 | 0.0199 | 0.0217 | 0.0314 |
| 0.0004 | 0.0000 | 0.0015 | 0.0011 | 0.0015 | 0.0019 | 0.0028 |
| 0.0026 | 0.0021 | 0.0078 | 0.0052 | 0.0067 | 0.0089 | 0.0130 |
| 0.0143 | 0.0117 | 0.0381 | 0.0305 | 0.0390 | 0.0482 | 0.0667 |
| 0.0031 | 0.0018 | 0.0016 | 0.0020 | 0.0041 | 0.0081 | 0.0099 |
| 0.0101 | 0.0086 | 0.0124 | 0.0106 | 0.0185 | 0.0217 | 0.0290 |
| 0.0022 | 0.0008 | 0.0032 | 0.0027 | 0.0033 | 0.0059 | 0.0075 |
| 0.0023 | 0.0015 | 0.0037 | 0.0030 | 0.0039 | 0.0056 | 0.0071 |
| 0.0029 | 0.0019 | 0.0055 | 0.0043 | 0.0062 | 0.0085 | 0.0106 |
| 0.0008 | 0.0000 | 0.0008 | 0.0010 | 0.0020 | 0.0014 | 0.0000 |
| 0.0060 | 0.0064 | 0.0142 | 0.0123 | 0.0157 | 0.0206 | 0.0244 |
| 0.0006 | 0.0005 | 0.0012 | 0.0012 | 0.0013 | 0.0012 | 0.0036 |
| 0.0025 | 0.0027 | 0.0020 | 0.0020 | 0.0040 | 0.0046 | 0.0052 |
| 0.0008 | 0.0003 | 0.0000 | 0.0000 | 0.0005 | 0.0005 | 0.0000 |
| 0.0002 | 0.0000 | 0.0004 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0016 | 0.0000 | 0.0018 | 0.0019 | 0.0024 | 0.0045 | 0.0061 |
| 0.0000 | 0.0000 | 0.0023 | 0.0002 | 0.0009 | 0.0014 | 0.0000 |
| 0.0021 | 0.0000 | 0.0005 | 0.0020 | 0.0025 | 0.0008 | 0.0033 |
| 0.0030 | 0.0021 | 0.0155 | 0.0139 | 0.0153 | 0.0144 | 0.0196 |
| 0.0087 | 0.0058 | 0.0338 | 0.0224 | 0.0276 | 0.0443 | 0.0608 |
| 0.0173 | 0.0091 | 0.0374 | 0.0282 | 0.0375 | 0.0715 | 0.0842 |
| 0.0000 | 0.0000 | 0.0010 | 0.0000 | 0.0012 | 0.0030 | 0.0037 |
| 0.0008 | 0.0005 | 0.0029 | 0.0018 | 0.0026 | 0.0070 | 0.0090 |
| 0.0033 | 0.0023 | 0.0072 | 0.0071 | 0.0091 | 0.0113 | 0.0143 |
| 0.0032 | 0.0019 | 0.0024 | 0.0032 | 0.0047 | 0.0031 | 0.0103 |
| 0.0012 | 0.0009 | 0.0005 | 0.0012 | 0.0014 | 0.0008 | 0.0000 |
| 0.0000 | 0.0004 | 0.0012 | 0.0002 | 0.0015 | 0.0017 | 0.0000 |
| 0.0014 | 0.0009 | 0.0137 | 0.0000 | 0.0020 | 0.0251 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0004 | 0.0009 | 0.0004 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0038 | 0.0016 | 0.0105 | 0.0119 | 0.0147 | 0.0180 | 0.0186 |

| L2.5-600 Bot | L3-300 Top | L3-300 Mid | L3-300 Bot | L3-400 Top | L3-400 Mid | L3-400 Bot |
|---|---|---|---|---|---|---|
| 0.0022 | 0.0029 | 0.0133 | 0.0011 | 0.0047 | 0.0033 | 0.0032 |
| 0.0144 | 0.0154 | 0.0117 | 0.0061 | 0.0277 | 0.0163 | 0.0081 |
| 0.0105 | 0.0155 | 0.0105 | 0.0052 | 0.0261 | 0.0137 | 0.0071 |
| 0.0028 | 0.0026 | 0.0023 | 0.0015 | 0.0043 | 0.0032 | 0.0016 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0004 |
| 0.0038 | 0.0040 | 0.0050 | 0.0023 | 0.0043 | 0.0017 | 0.0027 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0005 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0124 | 0.0150 | 0.0139 | 0.0089 | 0.0187 | 0.0114 | 0.0125 |
| 0.0028 | 0.0037 | 0.0027 | 0.0015 | 0.0066 | 0.0013 | 0.0029 |
| 0.0145 | 0.0171 | 0.0131 | 0.0081 | 0.0279 | 0.0092 | 0.0136 |
| 0.0008 | 0.0010 | 0.0007 | 0.0000 | 0.0017 | 0.0000 | 0.0006 |
| 0.0042 | 0.0067 | 0.0049 | 0.0032 | 0.0120 | 0.0024 | 0.0049 |
| 0.0284 | 0.0419 | 0.0439 | 0.0279 | 0.0720 | 0.0436 | 0.0338 |
| 0.0059 | 0.0054 | 0.0050 | 0.0037 | 0.0067 | 0.0055 | 0.0058 |
| 0.0185 | 0.0144 | 0.0196 | 0.0136 | 0.0228 | 0.0152 | 0.0221 |
| 0.0037 | 0.0045 | 0.0046 | 0.0029 | 0.0061 | 0.0031 | 0.0035 |
| 0.0036 | 0.0039 | 0.0044 | 0.0030 | 0.0057 | 0.0036 | 0.0022 |
| 0.0062 | 0.0062 | 0.0063 | 0.0051 | 0.0101 | 0.0067 | 0.0100 |
| 0.0011 | 0.0008 | 0.0020 | 0.0012 | 0.0011 | 0.0005 | 0.0017 |
| 0.0105 | 0.0177 | 0.0175 | 0.0099 | 0.0257 | 0.0183 | 0.0162 |
| 0.0011 | 0.0017 | 0.0012 | 0.0012 | 0.0027 | 0.0013 | 0.0019 |
| 0.0047 | 0.0033 | 0.0050 | 0.0044 | 0.0058 | 0.0040 | 0.0076 |
| 0.0012 | 0.0018 | 0.0014 | 0.0013 | 0.0034 | 0.0004 | 0.0015 |
| 0.0000 | 0.0000 | 0.0010 | 0.0000 | 0.0005 | 0.0000 | 0.0015 |
| 0.0036 | 0.0035 | 0.0062 | 0.0033 | 0.0042 | 0.0028 | 0.0047 |
| 0.0000 | 0.0053 | 0.0000 | 0.0007 | 0.0064 | 0.0000 | 0.0068 |
| 0.0018 | 0.0010 | 0.0068 | 0.0000 | 0.0007 | 0.0021 | 0.0015 |
| 0.0109 | 0.0238 | 0.0170 | 0.0234 | 0.0451 | 0.0106 | 0.0203 |
| 0.0211 | 0.0437 | 0.0282 | 0.0251 | 0.0731 | 0.0210 | 0.0325 |
| 0.0319 | 0.0563 | 0.0465 | 0.0315 | 0.0848 | 0.0339 | 0.0429 |
| 0.0018 | 0.0016 | 0.0015 | 0.0008 | 0.0047 | 0.0041 | 0.0025 |
| 0.0023 | 0.0043 | 0.0033 | 0.0017 | 0.0101 | 0.0025 | 0.0040 |
| 0.0074 | 0.0065 | 0.0067 | 0.0060 | 0.0136 | 0.0086 | 0.0084 |
| 0.0065 | 0.0015 | 0.0070 | 0.0029 | 0.0031 | 0.0035 | 0.0030 |
| 0.0018 | 0.0021 | 0.0019 | 0.0010 | 0.0007 | 0.0006 | 0.0000 |
| 0.0011 | 0.0059 | 0.0000 | 0.0005 | 0.0086 | 0.0000 | 0.0022 |
| 0.0009 | 0.0228 | 0.0011 | 0.0127 | 0.0326 | 0.0000 | 0.0268 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0006 | 0.0000 | 0.0000 |
| 0.0004 | 0.0000 | 0.0000 | 0.0000 | 0.0013 | 0.0014 | 0.0007 |
| 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0007 |
| 0.0092 | 0.0050 | 0.0053 | 0.0056 | 0.0158 | 0.0101 | 0.0074 |

| L3-450 Top | L3-450 Mid | L3-450 Bot | L3-500 Top | L3-500 Mid | L3-500 Bot | L3-550 Top |
|---|---|---|---|---|---|---|
| 0.0035 | 0.0045 | 0.0012 | 0.0041 | 0.0017 | 0.0014 | 0.0024 |
| 0.0298 | 0.0139 | 0.0076 | 0.0247 | 0.0147 | 0.0076 | 0.0134 |
| 0.0265 | 0.0109 | 0.0057 | 0.0207 | 0.0093 | 0.0055 | 0.0130 |
| 0.0030 | 0.0023 | 0.0021 | 0.0035 | 0.0020 | 0.0014 | 0.0016 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0025 | 0.0029 | 0.0015 | 0.0016 | 0.0029 | 0.0018 | 0.0019 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0143 | 0.0092 | 0.0064 | 0.0096 | 0.0089 | 0.0066 | 0.0103 |
| 0.0050 | 0.0030 | 0.0016 | 0.0040 | 0.0023 | 0.0016 | 0.0024 |
| 0.0304 | 0.0171 | 0.0106 | 0.0264 | 0.0141 | 0.0095 | 0.0152 |
| 0.0013 | 0.0005 | 0.0005 | 0.0014 | 0.0009 | 0.0006 | 0.0009 |
| 0.0154 | 0.0061 | 0.0038 | 0.0137 | 0.0044 | 0.0026 | 0.0077 |
| 0.0533 | 0.0339 | 0.0271 | 0.0558 | 0.0318 | 0.0237 | 0.0310 |
| 0.0071 | 0.0045 | 0.0036 | 0.0025 | 0.0038 | 0.0031 | 0.0027 |
| 0.0174 | 0.0145 | 0.0118 | 0.0170 | 0.0135 | 0.0120 | 0.0136 |
| 0.0068 | 0.0034 | 0.0022 | 0.0056 | 0.0031 | 0.0021 | 0.0036 |
| 0.0068 | 0.0041 | 0.0031 | 0.0049 | 0.0036 | 0.0030 | 0.0034 |
| 0.0086 | 0.0057 | 0.0045 | 0.0097 | 0.0047 | 0.0043 | 0.0062 |
| 0.0005 | 0.0036 | 0.0011 | 0.0020 | 0.0000 | 0.0012 | 0.0003 |
| 0.0255 | 0.0132 | 0.0110 | 0.0199 | 0.0142 | 0.0105 | 0.0124 |
| 0.0025 | 0.0015 | 0.0013 | 0.0022 | 0.0011 | 0.0008 | 0.0015 |
| 0.0060 | 0.0037 | 0.0041 | 0.0027 | 0.0047 | 0.0035 | 0.0045 |
| 0.0023 | 0.0000 | 0.0000 | 0.0004 | 0.0007 | 0.0004 | 0.0007 |
| 0.0000 | 0.0000 | 0.0000 | 0.0004 | 0.0000 | 0.0000 | 0.0000 |
| 0.0017 | 0.0026 | 0.0019 | 0.0014 | 0.0032 | 0.0028 | 0.0038 |
| 0.0045 | 0.0008 | 0.0012 | 0.0026 | 0.0000 | 0.0011 | 0.0031 |
| 0.0008 | 0.0048 | 0.0000 | 0.0008 | 0.0021 | 0.0000 | 0.0004 |
| 0.0065 | 0.0070 | 0.0066 | 0.0122 | 0.0133 | 0.0097 | 0.0088 |
| 0.0457 | 0.0240 | 0.0210 | 0.0601 | 0.0237 | 0.0182 | 0.0298 |
| 0.0996 | 0.0343 | 0.0336 | 0.0538 | 0.0318 | 0.0246 | 0.0409 |
| 0.0029 | 0.0006 | 0.0007 | 0.0010 | 0.0017 | 0.0007 | 0.0009 |
| 0.0079 | 0.0031 | 0.0020 | 0.0091 | 0.0026 | 0.0016 | 0.0038 |
| 0.0109 | 0.0078 | 0.0077 | 0.0146 | 0.0072 | 0.0067 | 0.0083 |
| 0.0025 | 0.0032 | 0.0017 | 0.0036 | 0.0036 | 0.0023 | 0.0007 |
| 0.0014 | 0.0013 | 0.0007 | 0.0000 | 0.0010 | 0.0005 | 0.0014 |
| 0.0051 | 0.0000 | 0.0011 | 0.0030 | 0.0012 | 0.0005 | 0.0018 |
| 0.0128 | 0.0071 | 0.0150 | 0.0124 | 0.0000 | 0.0115 | 0.0155 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0005 | 0.0000 | 0.0000 | 0.0018 | 0.0008 | 0.0005 | 0.0011 |
| 0.0000 | 0.1288 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0099 | 0.0114 | 0.0146 | 0.0253 | 0.0125 | 0.0124 | 0.0126 |

| L3-550 Mid | L3-550 Bot | L3-600 Top | L3-600 Mid | L3-600 Bot | L4-300 Top | L4-300 Mid |
|---|---|---|---|---|---|---|
| 0.0061 | 0.0008 | 0.0031 | 0.0211 | 0.0010 | 0.0020 | 0.0023 |
| 0.0251 | 0.0072 | 0.0138 | 0.0266 | 0.0066 | 0.0129 | 0.0143 |
| 0.0176 | 0.0055 | 0.0102 | 0.0160 | 0.0051 | 0.0130 | 0.0099 |
| 0.0044 | 0.0009 | 0.0019 | 0.0038 | 0.0010 | 0.0018 | 0.0026 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0037 | 0.0016 | 0.0018 | 0.0052 | 0.0015 | 0.0011 | 0.0026 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0143 | 0.0075 | 0.0108 | 0.0205 | 0.0060 | 0.0057 | 0.0114 |
| 0.0056 | 0.0016 | 0.0025 | 0.0045 | 0.0015 | 0.0019 | 0.0035 |
| 0.0278 | 0.0090 | 0.0143 | 0.0244 | 0.0092 | 0.0130 | 0.0143 |
| 0.0017 | 0.0003 | 0.0007 | 0.0033 | 0.0004 | 0.0004 | 0.0014 |
| 0.0128 | 0.0044 | 0.0061 | 0.0088 | 0.0028 | 0.0060 | 0.0089 |
| 0.0574 | 0.0240 | 0.0295 | 0.0536 | 0.0186 | 0.0285 | 0.0457 |
| 0.0037 | 0.0034 | 0.0030 | 0.0048 | 0.0034 | 0.0018 | 0.0019 |
| 0.0216 | 0.0125 | 0.0129 | 0.0266 | 0.0148 | 0.0108 | 0.0190 |
| 0.0054 | 0.0029 | 0.0039 | 0.0069 | 0.0024 | 0.0038 | 0.0042 |
| 0.0056 | 0.0030 | 0.0038 | 0.0069 | 0.0027 | 0.0037 | 0.0053 |
| 0.0101 | 0.0052 | 0.0044 | 0.0095 | 0.0039 | 0.0057 | 0.0084 |
| 0.0007 | 0.0004 | 0.0003 | 0.0042 | 0.0006 | 0.0000 | 0.0042 |
| 0.0208 | 0.0111 | 0.0122 | 0.0209 | 0.0088 | 0.0134 | 0.0114 |
| 0.0027 | 0.0013 | 0.0006 | 0.0010 | 0.0008 | 0.0021 | 0.0031 |
| 0.0062 | 0.0046 | 0.0055 | 0.0094 | 0.0053 | 0.0028 | 0.0071 |
| 0.0000 | 0.0006 | 0.0000 | 0.0019 | 0.0011 | 0.0007 | 0.0000 |
| 0.0000 | 0.0000 | 0.0004 | 0.0009 | 0.0000 | 0.0006 | 0.0000 |
| 0.0044 | 0.0033 | 0.0031 | 0.0064 | 0.0020 | 0.0015 | 0.0046 |
| 0.0000 | 0.0011 | 0.0026 | 0.0041 | 0.0005 | 0.0026 | 0.0000 |
| 0.0052 | 0.0000 | 0.0000 | 0.0072 | 0.0000 | 0.0006 | 0.0022 |
| 0.0130 | 0.0071 | 0.0094 | 0.0134 | 0.0053 | 0.0062 | 0.0122 |
| 0.0536 | 0.0238 | 0.0243 | 0.0366 | 0.0141 | 0.0201 | 0.0724 |
| 0.0540 | 0.0355 | 0.0454 | 0.0560 | 0.0229 | 0.0314 | 0.0458 |
| 0.0008 | 0.0008 | 0.0019 | 0.0000 | 0.0009 | 0.0007 | 0.0020 |
| 0.0051 | 0.0023 | 0.0040 | 0.0047 | 0.0013 | 0.0038 | 0.0038 |
| 0.0158 | 0.0076 | 0.0058 | 0.0127 | 0.0059 | 0.0035 | 0.0124 |
| 0.0037 | 0.0020 | 0.0014 | 0.0026 | 0.0029 | 0.0025 | 0.0053 |
| 0.0037 | 0.0004 | 0.0000 | 0.0036 | 0.0005 | 0.0010 | 0.0034 |
| 0.0009 | 0.0015 | 0.0008 | 0.0051 | 0.0010 | 0.0016 | 0.0003 |
| 0.0082 | 0.0131 | 0.0153 | 0.0210 | 0.0057 | 0.0099 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0019 | 0.0000 | 0.0000 | 0.0008 | 0.0000 | 0.0000 | 0.0000 |
| 0.0022 | 0.0013 | 0.0000 | 0.0012 | 0.0008 | 0.0004 | 0.0002 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0005 | 0.0000 | 0.0000 |
| 0.0251 | 0.0113 | 0.0061 | 0.0196 | 0.0091 | 0.0090 | 0.0071 |

| L4-300 Bot | L4-400 Top | L4-400 Mid | L4-400 Bot | L4-450 Top | L4-450 Mid | L4-450 Bot |
|---|---|---|---|---|---|---|
| 0.0014 | 0.0033 | 0.0008 | 0.0042 | 0.0016 | 0.0026 | 0.0051 |
| 0.0107 | 0.0147 | 0.0109 | 0.0224 | 0.0124 | 0.0137 | 0.0296 |
| 0.0094 | 0.0087 | 0.0070 | 0.0137 | 0.0071 | 0.0099 | 0.0186 |
| 0.0015 | 0.0020 | 0.0017 | 0.0044 | 0.0016 | 0.0026 | 0.0037 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0017 | 0.0018 | 0.0020 | 0.0038 | 0.0005 | 0.0019 | 0.0042 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0057 | 0.0077 | 0.0092 | 0.0132 | 0.0061 | 0.0078 | 0.0143 |
| 0.0019 | 0.0035 | 0.0026 | 0.0043 | 0.0021 | 0.0031 | 0.0053 |
| 0.0116 | 0.0152 | 0.0140 | 0.0213 | 0.0097 | 0.0155 | 0.0198 |
| 0.0007 | 0.0011 | 0.0011 | 0.0032 | 0.0005 | 0.0005 | 0.0021 |
| 0.0035 | 0.0065 | 0.0050 | 0.0068 | 0.0058 | 0.0068 | 0.0101 |
| 0.0210 | 0.0333 | 0.0295 | 0.0450 | 0.0284 | 0.0345 | 0.0563 |
| 0.0007 | 0.0016 | 0.0024 | 0.0046 | 0.0017 | 0.0026 | 0.0031 |
| 0.0133 | 0.0110 | 0.0141 | 0.0187 | 0.0116 | 0.0177 | 0.0235 |
| 0.0023 | 0.0044 | 0.0033 | 0.0044 | 0.0026 | 0.0033 | 0.0047 |
| 0.0025 | 0.0032 | 0.0031 | 0.0045 | 0.0057 | 0.0052 | 0.0085 |
| 0.0036 | 0.0057 | 0.0052 | 0.0061 | 0.0048 | 0.0059 | 0.0077 |
| 0.0004 | 0.0008 | 0.0014 | 0.0000 | 0.0011 | 0.0026 | 0.0051 |
| 0.0080 | 0.0126 | 0.0127 | 0.0188 | 0.0091 | 0.0115 | 0.0153 |
| 0.0000 | 0.0014 | 0.0011 | 0.0004 | 0.0014 | 0.0020 | 0.0035 |
| 0.0025 | 0.0018 | 0.0033 | 0.0043 | 0.0097 | 0.0059 | 0.0110 |
| 0.0018 | 0.0005 | 0.0000 | 0.0020 | 0.0000 | 0.0008 | 0.0020 |
| 0.0008 | 0.0014 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0004 |
| 0.0011 | 0.0022 | 0.0025 | 0.0033 | 0.0019 | 0.0026 | 0.0043 |
| 0.0033 | 0.0041 | 0.0000 | 0.0038 | 0.0016 | 0.0000 | 0.0044 |
| 0.0005 | 0.0017 | 0.0025 | 0.0005 | 0.0007 | 0.0032 | 0.0007 |
| 0.0053 | 0.0109 | 0.0093 | 0.0147 | 0.0094 | 0.0080 | 0.0120 |
| 0.0149 | 0.0281 | 0.0227 | 0.0361 | 0.0220 | 0.0389 | 0.0788 |
| 0.0190 | 0.0297 | 0.0313 | 0.0465 | 0.0298 | 0.0316 | 0.0495 |
| 0.0000 | 0.0010 | 0.0005 | 0.0013 | 0.0011 | 0.0006 | 0.0028 |
| 0.0016 | 0.0048 | 0.0031 | 0.0034 | 0.0022 | 0.0026 | 0.0026 |
| 0.0053 | 0.0094 | 0.0098 | 0.0137 | 0.0063 | 0.0089 | 0.0109 |
| 0.0010 | 0.0014 | 0.0038 | 0.0044 | 0.0031 | 0.0044 | 0.0037 |
| 0.0013 | 0.0015 | 0.0015 | 0.0014 | 0.0016 | 0.0030 | 0.0029 |
| 0.0045 | 0.0029 | 0.0007 | 0.0067 | 0.0003 | 0.0000 | 0.0051 |
| 0.0092 | 0.0109 | 0.0013 | 0.0191 | 0.0120 | 0.0015 | 0.0234 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0006 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0005 | 0.0010 | 0.0017 | 0.0014 | 0.0000 | 0.0005 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0088 | 0.0185 | 0.0218 | 0.0330 | 0.0016 | 0.0089 | 0.0034 |

| L4-500 Top | L4-500 Mid | L4-500 Bot | L4-550 Top | L4-550 Mid | L4-550 Bot |
|---|---|---|---|---|---|
| 0.0033 | 0.0006 | 0.0027 | 0.0046 | 0.0008 | 0.0035 |
| 0.0171 | 0.0064 | 0.0145 | 0.0202 | 0.0063 | 0.0228 |
| 0.0117 | 0.0040 | 0.0093 | 0.0128 | 0.0046 | 0.0160 |
| 0.0022 | 0.0005 | 0.0016 | 0.0022 | 0.0007 | 0.0025 |
| 0.0008 | 0.0000 | 0.0004 | 0.0000 | 0.0000 | 0.0000 |
| 0.0006 | 0.0005 | 0.0019 | 0.0020 | 0.0007 | 0.0033 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0071 | 0.0037 | 0.0065 | 0.0071 | 0.0037 | 0.0103 |
| 0.0030 | 0.0007 | 0.0026 | 0.0036 | 0.0009 | 0.0044 |
| 0.0139 | 0.0060 | 0.0107 | 0.0229 | 0.0088 | 0.0223 |
| 0.0003 | 0.0002 | 0.0016 | 0.0011 | 0.0000 | 0.0012 |
| 0.0108 | 0.0037 | 0.0054 | 0.0071 | 0.0028 | 0.0070 |
| 0.0408 | 0.0174 | 0.0269 | 0.0393 | 0.0180 | 0.0429 |
| 0.0025 | 0.0017 | 0.0022 | 0.0031 | 0.0019 | 0.0036 |
| 0.0169 | 0.0104 | 0.0142 | 0.0169 | 0.0097 | 0.0190 |
| 0.0044 | 0.0024 | 0.0032 | 0.0031 | 0.0018 | 0.0037 |
| 0.0072 | 0.0039 | 0.0042 | 0.0066 | 0.0030 | 0.0059 |
| 0.0061 | 0.0024 | 0.0031 | 0.0029 | 0.0029 | 0.0060 |
| 0.0038 | 0.0006 | 0.0016 | 0.0026 | 0.0006 | 0.0020 |
| 0.0127 | 0.0054 | 0.0069 | 0.0199 | 0.0103 | 0.0197 |
| 0.0024 | 0.0007 | 0.0015 | 0.0019 | 0.0005 | 0.0025 |
| 0.0073 | 0.0068 | 0.0067 | 0.0040 | 0.0031 | 0.0060 |
| 0.0003 | 0.0000 | 0.0015 | 0.0006 | 0.0000 | 0.0023 |
| 0.0000 | 0.0000 | 0.0009 | 0.0013 | 0.0000 | 0.0013 |
| 0.0011 | 0.0015 | 0.0023 | 0.0026 | 0.0015 | 0.0031 |
| 0.0014 | 0.0000 | 0.0041 | 0.0053 | 0.0000 | 0.0061 |
| 0.0008 | 0.0020 | 0.0009 | 0.0020 | 0.0025 | 0.0015 |
| 0.0039 | 0.0022 | 0.0048 | 0.0070 | 0.0027 | 0.0082 |
| 0.0553 | 0.0184 | 0.0277 | 0.0327 | 0.0154 | 0.0363 |
| 0.0450 | 0.0180 | 0.0230 | 0.0421 | 0.0237 | 0.0516 |
| 0.0018 | 0.0004 | 0.0015 | 0.0009 | 0.0000 | 0.0000 |
| 0.0041 | 0.0009 | 0.0016 | 0.0030 | 0.0017 | 0.0032 |
| 0.0106 | 0.0057 | 0.0060 | 0.0064 | 0.0046 | 0.0093 |
| 0.0049 | 0.0024 | 0.0015 | 0.0013 | 0.0017 | 0.0014 |
| 0.0023 | 0.0049 | 0.0038 | 0.0026 | 0.0035 | 0.0037 |
| 0.0000 | 0.0000 | 0.0037 | 0.0007 | 0.0000 | 0.0057 |
| 0.0155 | 0.0000 | 0.0084 | 0.0073 | 0.0005 | 0.0148 |
| 0.0000 | 0.0005 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0004 | 0.0000 | 0.0000 |
| 0.0022 | 0.0015 | 0.0015 | 0.0044 | 0.0031 | 0.0078 |

| Sample | Depth | Water Content (%) | Organic Carbon (%) | RSD (%) |
|---|---|---|---|---|
| L0-100 | Top | 10.5 | 8.4 | 24 |
| L0-100 | Middle | 11.1 | 7.2 | 13 |
| L0-100 | Bottom | 8.8 | 7.0 | 4 |
| L0-300 | Top | 1.9 | 1.7 | 5 |
| L0-300 | Middle | 1.5 | 2.8 | 27 |
| L0-300 | Bottom | 2.7 | 2.0 | 0 |
| L0-500 | Top | 10.2 | 9.7 | 2 |
| L0-500 | Middle | 9.6 | 8.4 | 9 |
| L0-500 | Bottom | 10.8 | 8.8 | 6 |
| L0-600 | Top | 12.0 | 8.6 | 8 |
| L0-600 | Middle | 13.9 | 6.6 | 19 |
| L0-600 | Bottom | 12.4 | 7.2 | 27 |
| L0-700 | Top | 19.8 | 4.2 | 33 |
| L0-700 | Middle | 8.5 | 6.5 | 22 |
| L0-700 | Bottom | 6.8 | 6.2 | 20 |
| L1-500 | Top | 13.4 | 5.0 | 24 |
| L1-500 | Middle | 16.3 | 6.6 | 12 |
| L1-500 | Bottom | 15.2 | 7.1 | 26 |
| L1-600 | Top | 5.7 | 2.6 | 11 |
| L1-600 | Middle | 7.1 | 2.5 | 16 |
| L1-600 | Bottom | 5.6 | 2.4 | 16 |
| L1-700 | Top | 6.1 | 5.2 | 67 |
| L1-700 | Middle | 4.9 | 4.3 | 43 |
| L1-700 | Bottom | 6.7 | 5.1 | 25 |
| L2-250 | Top | 7.8 | 8.7 | 24 |
| L2-250 | Middle/Bottom | 9.4 | 6.7 | 13 |
| L2-400 | Top | 15.4 | 3.9 | 10 |
| L2-400 | Middle | 15.9 | 6.6 | 23 |
| L2-400 | Bottom | 13.9 | 6.2 | 26 |
| L2-50 | Top/Middle/Bottom | 10.6 | 8.8 | 21 |
| L2-500 | Top | 9.0 | 7.5 | 6 |
| L2-500 | Middle | 17.1 | 7.6 | 4 |
| L2-500 | Bottom | 19.6 | 7.9 | 16 |
| L2-550 | Top | 10.9 | 5.9 | 28 |
| L2-550 | Middle | 13.8 | 6.5 | 13 |
| L2-550 | Bottom | 15.5 | 12.3 | 49 |
| L2-600 | Top | 19.7 | 6.9 | 4 |
| L2-600 | Middle | 26.9 | 8.0 | 11 |
| L2-600 | Bottom | 15.2 | 8.4 | 2 |
| L2-650 | Top | 15.0 | 5.9 | 31 |
| L2-650 | Middle | 17.6 | 6.6 | 12 |
| L2-650 | Bottom | 20.0 | 7.8 | 24 |
| L2-675 | Top | 3.3 | 3.3 | 30 |
| L2-675 | Middle | 10.5 | 3.8 | 33 |
| L2-675 | Bottom | 6.5 | 4.0 | 18 |

| Sample | Depth | Water Content (%) | Organic Carbon (%) | RSD (%) |
|---|---|---|---|---|
| L2-700 | Top | 16.9 | 6.7 | 0 |
| L2-700 | Middle | 16.4 | 7.4 | 12 |
| L2-700 | Bottom | 19.3 | 7.1 | 14 |
| L2-800 | Top | 14.6 | 6.8 | 17 |
| L2-800 | Middle | 15.1 | 7.1 | 4 |
| L2-800 | Bottom | 16.7 | 7.5 | 18 |
| L2.5-450 | Top | 4.9 | 4.4 | 33 |
| L2.5-450 | Middle | 10.5 | 6.1 | 13 |
| L2.5-450 | Bottom | 7.9 | 4.8 | 12 |
| L2.5-500 | Top | 5.1 | 3.8 | 13 |
| L2.5-500 | Middle | 7.1 | 5.3 | 28 |
| L2.5-500 | Bottom | 8.5 | 5.7 | 5 |
| L2.5-600 | Top | 10.3 | 7.0 | 2 |
| L2.5-600 | Middle | 8.8 | 9.1 | 4 |
| L2.5-600 | Bottom | 12.1 | 7.1 | 9 |
| L3-300 | Top | 12.8 | 6.7 | 8 |
| L3-300 | Middle | 12.8 | 8.7 | 26 |
| L3-300 | Bottom | 14.9 | 7.7 | 3 |
| L3-400 | Top | 13.2 | 7.4 | 21 |
| L3-400 | Middle | 8.8 | 6.8 | 20 |
| L3-400 | Bottom | 15.1 | 6.8 | 5 |
| L3-450 | Top | 13.6 | 5.3 | 21 |
| L3-450 | Middle | 7.4 | 6.5 | 2 |
| L3-450 | Bottom | 13.5 | 6.3 | 16 |
| L3-500 | Top | 6.1 | 4.9 | 4 |
| L3-500 | Middle | 6.5 | 6.8 | 5 |
| L3-500 | Bottom | 12.4 | 6.9 | 1 |
| L3-550 | Top | 9.3 | 6.2 | 26 |
| L3-550 | Middle | 8.0 | 6.6 | 29 |
| L3-550 | Bottom | 13.3 | 8.4 | 36 |
| L3-600 | Top | 13.3 | 7.2 | 38 |
| L3-600 | Middle | 13.4 | 8.3 | 18 |
| L3-600 | Bottom | 18.4 | 7.5 | 9 |
| L4-300 | Top | 10.5 | 7.4 | 19 |
| L4-300 | Middle | 15.0 | 11.0 | 4 |
| L4-300 | Bottom | 14.8 | 10.5 | 8 |
| L4-400 | Top | 8.9 | 5.6 | 9 |
| L4-400 | Middle | 9.3 | 7.4 | 10 |
| L4-400 | Bottom | 10.8 | 8.0 | 11 |
| L4-450 | Top | 13.5 | 5.2 | 36 |
| L4-450 | Middle | 11.4 | 6.6 | 24 |
| L4-450 | Bottom | 12.5 | 4.8 | 20 |
| L4-500 | Top | 12.4 | 7.4 | 9 |
| L4-500 | Middle | 9.7 | 6.4 | 19 |
| L4-500 | Bottom | 13.2 | 6.4 | 4 |
| L4-550 | Top | 12.7 | 6.5 | 7 |
| L4-550 | Middle | 11.1 | 8.1 | 43 |
| L4-550 | Bottom | 13.3 | 8.6 | 22 |

| | Compound | Ret Time | L2-50 | L2-250 Top |
|---|---|---|---|---|
| | | 460 | -26.5 | -28.9 |
| BAME 7 | C14:0 (tetradecanoate) | 508 | -30.1 | -28.8 |
| BAME 8 | 13me14:0 (13-methyltetradecanoate) | 592 | -26.3 | -27.3 |
| BAME 9 | 12me14:0 (12-methyltetradecanoate) | 603 | -24.8 | -26.3 |
| BAME 10 | 15:0 (pentadecanoate) | 643 | -30.2 | -29.1 |
| BAME 11 | 14:0-2OH (2-hydroxytetradecanoate) | 658 | | -28.2 |
| BAME 12 | 14:0-3OH (3-hydroxytetradecanoate) | 700 | -28.7 | -26.1 |
| BAME 13 | 14me15:0 (14-methylpentadecanoate) | 729 | -26.0 | -26.5 |
| 1613.0 | 13me15:0 (13-methylpentadecanoate) | 740 | | -26.6 |
| BAME 14 | 16:1w7c (cis-9-hexadecenoate) | 750 | -32.9 | -35.1 |
| P0203 | 16:1w7t (trans-9-hexadecanoate) | 756 | | |
| | 16:1w6c???? | 763 | -20.7 | -26.7 |
| BAME 15 | 16:0 (hexadecanoate) | 780 | -28.6 | -31.1 |
| | i17:1w7 (15-methylhexadec-10-enoic n | 786 | -21.7 | -25.7 |
| | | 802 | | -28.3 |
| | | 831 | -27.9 | -28.6 |
| 1792.0 | 10me16:0 (10-methylhexadecanoate) | 839 | -26.2 | -26.9 |
| | | 848 | -24.1 | -23.7 |
| BAME 16 | 15me16:0 (15-methylhexadecanoate) | 866 | -28.2 | -27.9 |
| | 14me16:0 (14-methylhexadecanoate m | 877 | -27.4 | -28.3 |
| H9021 | 17:1w7c (cis-10-heptadecanoate) | 882 | | -28.8 |
| BAME 17 | cy17:0 (cis-9,10-methylenehexadecano | 895 | -28.2 | -29.2 |
| BAME 18 | 17:0 (heptadecanoate) | 920 | -32.2 | -29.7 |
| BAME 19 | 17:0-2OH (2-hydroxyhexadecanoate) | 937 | | |
| 1796.0 | 10me17:0 (10-methylheptadecanoate) | 972 | | -33.5 |
| L6503 | 18:3w6c (cis 6,9,12 octadecatrienoate) | 988 | | -32.6 |
| BAME 20 | 18:2w6c (cis 9,12 octadecatrienoate) | 1004 | -31.6 | -33.2 |
| BAME 21 | 18:1w9c (cis-9octadecenoate) | 1012 | -26.3 | -27.2 |
| BAME 22 | 18:1w9t & 18:1w7c (trans-9-octadecan | 1020 | -27.4 | -15.5 |
| V1381 | 18:1w7t (trans-11-octadecenoic) | | | |
| | 18:1w6c???? | 1033 | -17.4 | -19.8 |
| BAME 23 | 18:0 (octadecanoate) | 1047 | -26.2 | -27.6 |
| | | 1056 | | -28.1 |
| | 10me18:0 (10-methyloctadecanoate me | 1098 | -26.1 | -25.5 |
| | 17me18:0 (17-methyloctadecanoate me | 1140 | | |
| BAME 24 | cy19:0 (cis-9,10-methyleneoctadecanoa | 1157 | -28.6 | -29.6 |
| BAME 25/N53 | 19:0 (nonadecanoate) | 1175 | | |
| | | 1197 | | |
| | | 1265 | | -30.6 |
| BAME 26 | 20:0 (eicosanoate) | 1298 | -28.2 | -29.5 |

COMPOUND SPECIFIC ISOTOPIC COMPOSITION OF LINE 2 PHOSPHOLIPIDS

| L2-250 Mid | L2-400 Top | L2-400 Mid | L2-400 Bot | L2-500 Top | L2-500 Mid |
|---|---|---|---|---|---|
| -28.7 | | | | | |
| -29.3 | | | | -25.2 | -25.5 |
| -27.3 | -27.9 | -27.6 | -27.7 | -26.0 | -25.9 |
| -26.6 | -26.7 | -26.7 | -26.9 | -23.6 | -23.7 |
| -30.6 | | | | -29.3 | -28.9 |
| -29.4 | | | | | |
| -28.6 | | | | | -26.7 |
| -26.9 | -27.4 | -28.0 | -28.6 | -25.4 | -25.9 |
| -27.7 | | | | -25.1 | -27.1 |
| -33.3 | -29.2 | -30.3 | -32.6 | -26.0 | -26.9 |
| | | | | | |
| -26.1 | -22.1 | -23.3 | -24.3 | -17.9 | -22.8 |
| -30.4 | -29.6 | -29.6 | -30.5 | -26.5 | -27.0 |
| -25.2 | -25.7 | -27.8 | | -20.8 | -24.9 |
| -28.2 | -28.4 | -28.8 | -29.7 | -28.5 | -27.5 |
| -28.5 | -29.2 | -29.4 | -30.0 | -28.3 | -28.5 |
| -27.4 | -28.8 | -28.6 | -28.7 | -26.9 | -25.5 |
| -19.9 | | | | -24.5 | -24.2 |
| -29.0 | | -28.9 | | -27.4 | -27.5 |
| -28.5 | | -27.2 | | -25.1 | -25.9 |
| -29.2 | | | | | |
| -29.3 | -29.3 | -28.1 | -28.5 | -26.9 | -27.6 |
| -29.0 | | -31.7 | -31.2 | -38.9 | -32.0 |
| | | | | | |
| | | | | | -27.6 |
| | | | | | |
| -34.5 | | -32.4 | -34.9 | -30.0 | -31.2 |
| -28.3 | -27.5 | -27.6 | -28.5 | -24.1 | -25.7 |
| -28.6 | -30.0 | -29.3 | -29.4 | -28.0 | -28.2 |
| | | | | | |
| -17.2 | | | | -17.6 | -19.1 |
| -28.6 | -29.0 | -28.7 | -29.1 | -24.9 | -25.8 |
| -26.8 | | | | -24.4 | |
| -25.2 | -28.2 | -27.7 | -27.7 | -22.7 | -26.0 |
| | | | | | |
| -29.6 | -30.1 | -31.4 | -30.3 | -28.2 | -28.4 |
| | | | | | |
| | | | | -28.6 | |
| | | | | | |
| -29.1 | | | | -27.9 | -27.0 |

| L2-500 Bot | L2-550 Top | L2-550 Bot | L2-600 Top | L2-600 Mid | L2-600 Bot |
|---|---|---|---|---|---|
| | | | | -24.8 | |
| -25.7 | -26.9 | -26.5 | -26.0 | -26.2 | -25.7 |
| -24.4 | -23.5 | -24.0 | -23.3 | -23.4 | -23.9 |
| | | | | -29.6 | |
| | | | | | |
| | | | | -27.4 | |
| -25.9 | -26.2 | -26.1 | -25.7 | -25.6 | -25.2 |
| | | | | -25.8 | |
| -28.0 | -27.4 | -26.0 | -27.2 | -27.1 | -26.0 |
| | | | | | |
| -21.5 | -19.6 | | | -21.9 | -15.4 |
| -28.0 | -27.3 | -27.9 | -27.0 | -27.8 | -28.0 |
| -25.3 | -14.7 | | -25.3 | -21.1 | |
| | -29.2 | | -28.5 | -27.4 | |
| -27.7 | -28.8 | | | -28.8 | |
| -25.6 | -27.0 | -27.0 | -25.3 | -26.8 | -25.3 |
| | -24.1 | | | -23.4 | |
| | -27.1 | | | -28.1 | |
| -26.9 | -24.9 | -26.7 | -26.6 | -26.4 | -26.4 |
| | | | | | |
| -27.8 | -26.9 | -27.1 | -27.3 | -27.7 | -27.7 |
| -32.5 | -28.5 | -29.4 | | -32.9 | |
| | | | | | |
| | -27.6 | | | -26.0 | |
| | | | | | |
| -32.5 | -32.4 | -32.1 | -32.0 | -32.8 | -33.3 |
| -26.8 | -25.5 | -26.2 | -25.1 | -25.6 | -25.6 |
| -27.9 | -27.7 | -26.8 | -28.4 | -28.9 | -27.6 |
| | | | | | |
| | -17.4 | | | -18.0 | |
| -27.0 | -24.8 | -27.9 | -27.7 | -26.9 | -27.2 |
| | -26.1 | | | | |
| -26.6 | | | | -25.6 | |
| | | | | | |
| -28.7 | -28.1 | -27.6 | -28.4 | -28.5 | -28.3 |
| | | | | | |
| | | | | | |
| | | | | | |
| -27.8 | -32.2 | -29.3 | -28.8 | -30.0 | -28.4 |

| L2-650 Top | L2-650 Mid | L2-650 Bot | L2-675 Top | L2-675 Mid | L2-675 Bot |
|---|---|---|---|---|---|
| | | | | | |
| | | -27.1 | | | |
| -26.2 | -25.6 | -24.9 | -25.6 | -24.1 | -24.8 |
| -23.1 | -23.9 | -24.4 | | -24.5 | -25.0 |
| | | -29.6 | | | |
| | | | | | |
| | | -27.2 | | | |
| -25.7 | | -26.0 | | -25.1 | -25.1 |
| | | | | | |
| -27.2 | -26.7 | -27.1 | -26.3 | -25.0 | -25.6 |
| | | -19.2 | | | |
| -18.4 | | -20.1 | | -14.5 | -16.3 |
| -26.7 | -27.0 | -28.5 | -25.6 | -26.5 | -27.3 |
| | | | | | |
| -29.9 | -29.5 | | -28.6 | -29.2 | |
| | | -26.8 | | | -27.0 |
| -27.5 | | -25.9 | | -24.5 | -24.9 |
| | | -22.6 | | | |
| | | -26.2 | | | |
| -26.3 | | -27.7 | | -26.9 | -27.7 |
| | | | | | |
| -29.3 | | -28.2 | -26.8 | -26.8 | -26.8 |
| -33.8 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| -31.1 | -29.6 | -31.4 | -29.3 | -30.0 | -32.2 |
| -25.0 | -24.9 | -24.1 | -22.7 | -24.9 | -25.7 |
| -27.6 | -27.4 | -26.8 | -27.6 | -27.4 | -27.4 |
| | | | | | |
| -17.9 | | -17.6 | | | |
| -27.0 | | -25.9 | -27.1 | -25.9 | -26.5 |
| | | -22.2 | | | |
| | | -24.2 | | | |
| | | -27.6 | | | |
| -29.0 | -27.8 | -28.2 | -27.0 | -27.1 | -27.4 |
| | | | | | |
| -29.3 | | | | | |
| | | -30.5 | | | |
| -28.5 | -28.2 | -27.8 | -27.4 | -26.7 | -27.4 |

| L2-700 Top | L2-700 Mid | L2-700 Bot | L2-800 Top | L2-800 Bot |
|---|---|---|---|---|
| | | | -26.5 | -25.2 |
| -26.9 | -26.1 | -27.2 | -26.7 | -27.0 |
| -24.8 | -23.6 | -26.2 | -23.6 | -23.9 |
| | | | -30.5 | -30.8 |
| | | | | |
| | | | -29.1 | -26.6 |
| -26.1 | -27.1 | -27.0 | -26.8 | -26.7 |
| | | | | |
| -28.5 | -26.5 | -28.0 | -26.8 | -28.2 |
| | | | | |
| -21.0 | | | -22.4 | -22.5 |
| -27.1 | -28.2 | -28.7 | -27.1 | -27.9 |
| | -28.0 | -25.9 | -23.5 | -12.9 |
| -28.6 | -28.8 | | -27.1 | -28.8 |
| | | -34.3 | -29.0 | |
| -26.3 | -25.3 | -2.3 | -27.1 | -26.9 |
| | | | -23.1 | -24.4 |
| | | | -27.7 | -28.0 |
| -25.2 | | -26.1 | -26.5 | -27.2 |
| | | | -24.5 | |
| -28.2 | -27.7 | -27.8 | -27.9 | -27.0 |
| | -30.2 | -30.1 | -29.4 | -29.4 |
| | | | | |
| | | | -27.4 | -27.4 |
| | | | | |
| -30.8 | -30.2 | -33.4 | -34.2 | -33.6 |
| -24.8 | -25.6 | -27.5 | -25.2 | -26.9 |
| -27.0 | -27.8 | -27.8 | -27.7 | -27.5 |
| | | | | |
| -18.5 | | | | -16.3 |
| -27.6 | -27.7 | -28.3 | | -25.6 |
| | | | | |
| | | -27.6 | -24.4 | -26.0 |
| | | | | |
| -29.1 | -28.3 | -29.4 | -28.0 | -28.2 |
| | | | | |
| | | | | |
| | | | | |
| -28.4 | -30.0 | -28.5 | -30.4 | -28.4 |